RAILROAD GAZETTE

QUARTO VOL. XXIV.—NO 48. A JOURNAL OF TRANSPORTATION ENGINEERING AND RAILROAD NEWS. THIRTY-SEVENTH YEAR.

NEW YORK: Published at 73 Broadway. FRIDAY, NOVEMBER 25, 1892. $4.20 PER YEAR TO U.S. AND CANADA. $5.08 " " FOREIGN COUNTRIES.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS MAIL MATTER OF THE SECOND CLASS.


SAFET
COPYRIGI
PA
OCT. 22, 18
GA

ALPHABETICAL INDEX TO ADVERTISEMENTS.

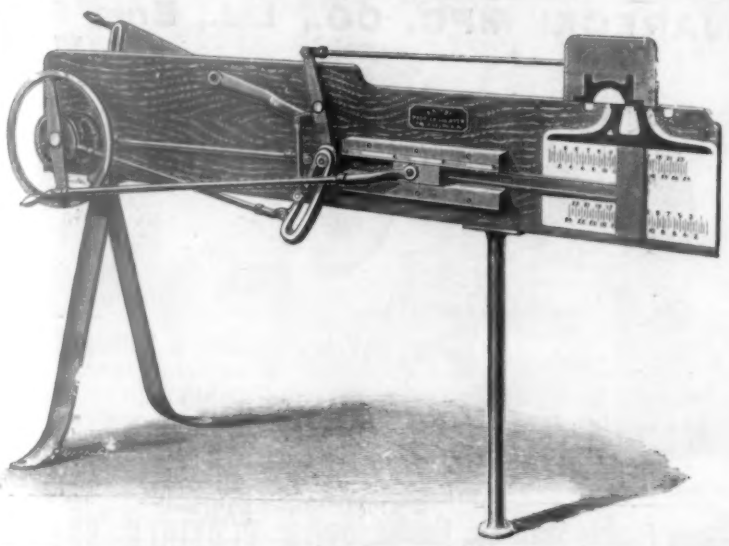
Classified Index on the next page.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

Air Brake Fittings
Stanley G. Flagg & Co., Phila.
Air Brake Hose
N.Y. Belt. & Pack. Co., Ltd.,15 Park Row.
Air Brake Regulator
Mason Regulator Co., Boston.
Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10 Park Place, N. Y.
Rand Drill Co., 23 Park Place, N. Y.
Architects
Bradford L. Gilbert, 50 Broadway, N. Y.
Thomas Appleton, 505 Rialto Bldg., Chic.
Architectural Iron Work
King Bridge Co., Cleveland, O.
Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima O.
Louisville Steam Forge Co., Louisv., Ky.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Nicetown, Phila.
Pittsb'gh Forge & Iron Co., Pittsb., Pa.
T. Prosser & Son, 15 Gold St., N. Y.
Balanced Slide-Valves
M. C. Hammett, Troy, N. Y.
Ballast Unloaders
Bucyrus (O.) Steam Shov. & Dredge Co.
Marion Steam Shovel Co., Marion, O.
Bankers
Brown Bros. & Co., 59 Wall street, N. Y.
Bell Cord & Couplings
Samson Cordage Works, Boston, Mass.
Boilers
Abendroth&RootMfg.Co.,28Cliff St,N.Y.
Thos. Carlin's Sons, Allegheny, Pa.
C. W. Hunt Co., New York City.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.
Rich. Loco. & Mach. Co., Richmond, Va.
Boiler Fronts and Fittings
Vulcan Iron Works, Toledo, O.
Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.
Wellman Iron & Steel Co ,Thurlow, Pa.
Bolt Cutters
Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N. Y.
Bolts & Nuts
Fuller Bros. & Co., 129 Gr'nwich St., N.Y.
Rhode Island Tool Co., Providence.
Books & Publications
E. & F. N. Spon & Co.,12 Cortl'dt St.,N.Y.
John C. Trautwine, Jr.
Brake Adjusters
Buckley Brake Co., Trenton, N. J.
Q. & C. Co., Chicago.
Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.
Brakes
Boyden Brake Co., Baltimore, Md.
New York Air Brake Co., 115 B'way,N
Westinghouse Air-Brake Co., Pittsb.,Pa.
Brake-Shoes
Congdon Brake Shoe Co., Chicago, Ill.
Ramapo (N. Y.) Wheel & Foundry Co.
Bridges
Anderson & Fair, Jersey City, N. J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Cofrode & Saylor, Philadelphia, Pa.
Detroit Bridge & Iron Wks, Det., Mich.
Edge Moor BridgeWks,Wilmington,Del.
Elmira Bridge Co., Elmira, N. Y.
S. W. Fresco1n, World Bldg., N. Y.
Keystone Bridge Co., Pittsburgh, Pa.
Louisville Bridge & Iron Co.,Louisv.,Ky.
Mo. Val. Br. & Ir. Wks., Leavenw., Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N. J.
Phœnixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co.,1105 Owings Bldg. Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & Ir. Wks, Rochester
A. & P. Robert's & Co., Philadelphia, Pa.
San Francisco Bridge Co., New York.
Shaller & Schniglau, Chicago, Ill.
Shiffler Bridge Co., Pittsburgh, Pa.
Sooysmith & Co., 2 Nassau street N. Y.
Union Bridge Co., 18 Broadway, N. Y.
J. A. L. Waddell, Kansas City, Mo.
Wallis Iron Works, Jersey City, N. J.
Youngstown (Ohio) Bridge Co.
Bridge Machinery
Vulcan Iron Works, Chicago.
Bridge Timbers
Alexander McClure, Pittsburgh, Pa.
Buildings
Berlin Iron Bridge Co., E. Berlin, Conn.
Bulldozers
Williams, White & Co., Moline, Ill.
Cable Railways
C. W. Hunt Co., New York City.
Cars
Allison Mfg. Co., Philadelphia, Pa.
Bloomsburg Car Co., Bloomsburg, Pa.
Osgood Bradley & Sons, Worcester, Mass.
Canda Mfg. Co., 11 Pine St., N. Y.
Reginald Canning & Co., 115 B'way, N.Y.
Ensign Mfg. Co., Huntington, West Va.
Erie Car Works (Limited), Erie, Pa.
Harvey Steel Car Co., Chicago., Ill.
Jackson & Sharp Co., Wilmington, Del.
Jackson & Woodin Mfg.Co., Berwick, Pa.
A. S. Males & Co., Cincinnati.
Middletown Car Wks, Middletown, Pa.
N. Y. Equipment Co., 15 Wall St., N. Y.
R. M. Pancoast, Camden, N. J.
Portland Co., Portland, Me.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngstown (Ohio) Car Mfg. Co.
Cars, Second Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Car Couplings
Auto. Interchangeable Car Coupler Co., San Francisco, Cal.
Buckeye Aut.Car Coup.Co.,Columbus,O.
Drexel Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
Johnston Car Coupling Co., Phila., Pa.
McConway & Torley Co., Pittsburgh, Pa.
McG Iron Works Co., Peoria, Ill.
Pratt & Letchworth, Buffalo, N. Y.
St. Louis Car Coupler Co., St. Louis, Mo.
Smillie Coupler & Mfg. Co., Newark, N.J.
Trojan Car Coupler Co., Troy, N. Y.
Van Dorston Coup. Co., Phila., Pa.
Car Doors
Amer. Car Door Co., Indianap., Ind.
Q. & C. Co., Chicago, Ill.
Wagner Car Door Co., Indianap., Ind.
Car Heaters
William C. Baker,799 Gr'nwich St., N.Y.
Consol. Car Heating Co., Albany, N. Y.
Gold Car Heat. Co., Frankfort St., N. Y.
Martin A. P. Car-Heat. Co., Dunkirk, N.Y.
Morton Safety Heating Co.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car H. & Light Co., 160 B'way, N Y
Car Heating Equipment
Moran Flex. St'm Joint Co., Louisv., Ky.
Stanley G. Flagg & Co., Philadelphia.
Car Machinery
Greenlee Bros. & Co., Chicago.
Car Platform Gates
J. B. Goodwin, 29 B'way, N. Y.
Car Plushes
D. Goff & Sons, Pawtucket, R. I.
Car Replacers
Q. & C. Co., Chicago.
Car Roofing
Drake & Weirs, Cleveland, O.
C. B. Hutchins & Sons, Detroit.
Car Seals
Buffalo Seal & Press Co., Buffalo, N. Y.
Car Seats
Hale & Kilburn Mfg. Co., Phila.
Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N. Y. City.
Baltimore Car-Wheel Co., Balto., Md.
Barnum & RichardsonMfg.Co.,Chicago.
Boles Steel Wheel Co , Scranton, Pa.
Bowler & Co., Cleveland.
Davenport & Fairbairn Erie, Pa
C. G. Eckstein & Co., 41 John St. N.Y.
Jersey City Wheel Fd'y & Mach. Works,
Lima Machine Works, Lima, O.
Lobdell Car-Wheel Co., Wilmington, Del.
N. Y. Car Wheel Works, Buffalo.
Thos. Prosser & Son, 15 Gold street, N.Y.
Ramapo Wheel & F'dry Co , Ramapo, N.Y.
Stand. Steel W'ks, 220 So. 4th St., Phila.
Taylor Iron & Steel Co., High Bridge, N.J.
Washburn Car-Wheel Co., Hartf'd, Conn.
Wason Mfg. Co., Springfield, Mass.
A. Whitney & Sons, Phila., Pa.
Car Window Balance
O. E. Gardner, Box 171, Pittsburgh, Pa.
Cattle Guards
Bush Cattle Guard Co., Kalamazoo, Mich.
Kalamazoo (Mich.) R.R.Veloc. & Car Co.
Merrill-Stevens Mfg. Co., Niles, Mich.
Wolhaupter, Benj., 39-43 Washington St., Chicago, Ill.
Chemists
Pittsb. Testing Laboratory, Pittsb., Pa.
Coal Chute
Williams, White & Co., Moline, Ill.
Consulting Engineers
Thomas Appleton, 505 Rialto Bldg.,Chic.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Fresco1n, World bldg., N. Y.
Geo. L. Fowler, 38 Broadway, N. Y.
A. Leofred, Quebec.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 45 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
P. H. Smith, 227 E. German St., Balto., Md.
Von Schon & Garver, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Contractor
Mairs & Lewis 18 B'way, N. Y.
Contractors' Cars
Thos. Carlin's Sons, Allegheny, Pa.
Contractors' Cars
Port Chester (N. Y.) Wagon Co.
Contractors' Supplies
H. Channon Co., Chicago, Ill.
Conveyors
Link Belt Eng. Co., Nicetown, Phila.
Copper
Hendricks Bros., 49 Cliff street, N. Y.
Creosoting
Creo. Lumber & Con.Co.Fernandina, Fla.
Lehigh Valley Creo. W'ks, P. Amboy, N.J.
Cordage
Samson Cordage Works, Boston, Mass.
Cranes
Thos. Carlin's Sons, Allegheny, Pa.
Industrial Works, Bay city, Mich.
John N. Poage, Cincinnati, O.
A. J. Sweeney & Son, Wheeling, W. Va.
R. D. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg. Co., Stamford, Conn.
Crossings
Fontaine Crossing Co., Detroit, Mich.
Crossing Gates
Bogue & Mills Mfg. Co., Chicago.
Gorham Pneumatic Gate Co., Chic., Ill.
Culvert Pipe
Blackmer Post, St. Louis Mo.
Cupola Furnaces
Victor Colliau, Detroit, Mich.
Draft Rigging
Schoen Mfg. Co., Pittsburgh, Pa.
Drawbar Attachment
Amer. Cont. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N. Y. City.
Butler Drawbar Attach. Co., Cleveland.
Hinson Drawbar Attach. Co., Chicago.
Dredging Machinery
Bucyrus (O.) Steam Shovel & Dredge Co
San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago
Vulcan Iron Works, Toledo.
Drop Forgings
Billings & Spencer Co., Hartford, Conn.
Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.
Electrical Contractors
H. Ward Leonard & Co., New York.
Elevators
Link Belt Eng. Co., Nicetown, Phila.
Otis Brothers & Co., 38 Park Row, N.Y.C.
Emery Wheels
N.Y. Belt. & Pack.Co., Ltd.,15 Park Row.
Northampton Emery W.Co.,Leeds,Mass.
Springf'ld Em'y Wh'l Co , Bridgep't,Ct
Tanite Co., Stroudsburg, Pa.
Engineering Employment Bureau
Engineer. Employm't Bureau, 5 Granger Block, Syracuse, N. Y.
National Agency, Phila., Pa.
Engineering Instruments
Chas. H. Brightly, Philadelphia, Pa.
Keller & Brightly Philadelphia, Pa.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Keuffel & Esser, New York City
Queen & Co., Philadelphia Pa.
Young & Sons, Philadelphia, Pa.
Engineers
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Fresco1n, World Bldg., N. Y.
Geo. L. Fowler, 38 Broadway, N. Y.
A. Leofred, Quebec.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 25 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
Pittsb. Test. Laboratory, Pittsb., Pa.
P. H. Smith, 227 E. German St., Balto, Md.
E. N. K. Talcott, 57 Broadway, N. Y.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Westinghouse, Church, Kerr & Co., 620 Atlantic Ave, Boston.
Engines
Thos. Carlin's Sons, Allegheny, Pa.
Fishkill Landing Mch. Co., Fishkill, N.Y.
Westinghouse, Church, Kerr & Co., 620 Atlantic Ave., Boston.
Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Toledo.
Explosives
Rendrock Powd.Co., 23 Park Place, N.Y.
Feed-Water Purifier
Field Water Purifier Co., Chicago.
Arthur Pennell, Kansas City, Mo.
Fences
Barkly & House, Chicago, Ill.
Western Fence Co., Chicago, Ill.
Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Fluoride
Amer. Fluoride Co., 126 Liberty St., N.Y
Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.
Freight Conveyors
Industrial Works, Bay City, Mich.
Forges
The Foos Mfg. Co., Springfield, O.
Furnaces
Abendroth & Root M.Co., 28 Cliff St., N.Y.
Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
Cleveland (O.) Frog & Crossing Co.
Elliot Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Kans. City Frog & Sw'ch Co., Kans. City.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Hillburn, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.
Gauges (Pressure)
Ashcroft Mfg. Co., 111 Liberty St., N.Y
Guarantee Co.
Guarantee Co. of N. A., Montreal.
Hand Cars
The Buda Fdy & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Sheffield Velocipede Car Co., Three Rivers, Mich.
Harbor Works
S. W. Fresco1n, World Bldg., N. Y.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Highway Crossing Signals
Electric Supply & Mfg. Co., Cleve'd, O.
Hoisting & Conveying Machinery
Brown Hoisting & Conveying Mach. Co. Cleveland, O.
C. W. Hunt Co., 45 B'way, New York.
King Bridge Co., Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.
Hoisting Engines
Thos. Carlin's Sons, Allegheny, Pa.
Copeland & Bacon, New York City.
C. W. Hunt Co., New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y
J. S. Mundy, Newark, N. J.
Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.
Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N. Y.
Joseph F. McCoy Co., 26 Warren St., N.Y.
Watson & Stillman, 240 E. 43d St., N. Y.
Hydraulic Machinery
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS

Industrial Railways
C. W. Hunt Co., New York City.
Injectors
Detroit Lubricator Co., Detroit, Mich.
Nathan Mfg. Co., 91 Liberty street, N. Y.
Wm. Sellers & Co., Philadelphia.
Inspectors
Pittsb. Test. Laboratory, Pittsb., Pa.
Inspectors of Bridges and Ry. Equipment
R. W. Hildreth & Co., 2 Wall St., N. Y.
Insurance
Hart. S. Boiler Insp. & Ins. Co., Hartford.
Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa
Hall Signal Co., 50 B'way, N. Y.
Johnson R. R. Sig. Co., Rahway, N. J.
Nat. Switch & S. Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh
Wharton R. R. Switch Co., Phila.
Iron—Taylor Yorkshire
R. M. Jones & Co., Boston, Mass.
Iron Work for Contractors
Edge Moor Bridge Wks, Wilmington, Del.
King Bridge Co., Cleveland, O.
Jacks
Fairbanks, Morse & Co., Chicago.
McSherry Mfg. Co., Dayton, O.
Richard Dudgeon, 24 Columbia St., N. Y.
Watson & Stillman, 210 E. 43d St., N. Y.
Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
D. A. Hopkins Mfg. Co., 143 Liberty St. N.Y
Illinois Alloy Co., Chicago.
Phosphor-Bronze Smelting Co., Philada.
Paul S. Reeves, Philadelphia, Pa.
Journal Bearing—Tubular
Mencely Bearing Co., W. Troy, N. Y.
Journal-Box Lids
Ramapo (N. Y.) Wheel & F'dry Co.
Lighting
Adams & Westlake Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat & Light. Co., 160 B'way.
Link Belting
Link Belt Eng. Co., Nicetown, Phila.
Lock Washers
Nat. Lock Washer Co., Newark N. J.
Locomotives
Baldwin Locomotive Works, Philada.
Brooks Locomotive W'ks, Dunkirk, N.Y.
Cooke Loco. & Mach. Co., Paterson, N.J.
Dickson Mfg. Co., Scranton, Pa.
G. L. Fowler, 53 Broadway, N. Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pittsburgh Loco. & Car W'ks, Pittsburgh.
H. K. Porter & Co., Pittsburgh, Pa.
Portland Co., Portland, Me.
Richmond (Va.) Loco. & Mach. Works.
Rogers Loc. & Mach. Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Taite & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.
Locomotive Ash Pans
Geo. L. Fowler, 53 B'way, N. Y.
Locomotive Boiler Tubes.
Allison Mfg. Co., Philadelphia, Pa.
Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.
Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.
Locomotives (Mining
C. W. Hunt Co., New York City.
Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way, N.Y.
Thos. Carlin's Sons, Allegheny, Pa.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Lubricators
Detroit Lubricator Co., Detroit, Mich.
Nathan Mfg. Co., 92 Liberty street, N. Y.
Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Bridgeport (Conn.) Mach. Tool Works.
Brown & Sharpe Mfg. Co., Providence.
Gould & Eberhardt, Newark, N. J.
Hayes Tool Co., Portland, Me.
Ingersoll Mill. Mach. Co., Rockford, Ill
Jarecki Mfg. Co., Erie Pa.
Long & Allstatter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St.
Morse Tw. Dr. & Mach. Co., N. Bed'd, Mass.
Newark Mach. Tool Wks., Newark, N. J.
Niles Tool Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia.
Stiles & Parker Press Co., Middletown, Conn.
Stow Flexible Shaft Co., Philg., Pa.
Stow Mfg. Co., Binghamton, N. Y.
A. J. Sweeney & Son, Wheeling, W. Va.
Universal Radial Drill Co., Cincinnati.
Watson & Stillman, 210 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.
Malleable Iron Castings.
National Mall. Castings Co., Cleveland.
Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Mining Machinery
Thos. Carlin's Sons, Allegheny, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Union Iron Works, San Francisco.
Nut Locks
Amer. Washer & Mfg. Co., Newark, N. J.
Eureka Nut Lock Co., Pittsburgh, Pa.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Positive Lock Wash. Co., Newark, N. J.
Ruffner & Dunn, Philadelphia, Pa.
Young Nut Lock, N. Y.
Oil
Signal Oil Works, Ltd., Franklin, Pa.
Oil Cans
Adams & Westlake Co., Chicago.
Ore Handling Machinery.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.
Packing, Metallic
Columbian Metal Rod Pack. Co., Phila.
U. S. Metallic Packing Co., Phila.
Packing, Rubber
Link Belt Eng. Co., Nicetown, Phila.
Paint
Canton Steel Roofing Co., Canton, O.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N.J.
Nat. Paint Works, Williamsport, Pa.
Patents
W. Dudley & Co., Washington, D. C.
S. C. Fitzgerald, Washington, D. C.
Howson & Howson, 119 So. 4th St., Phila
Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.
Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Thos. Carlin's Sons, Allegheny, Pa
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Vulcan Iron Works, Chicago, Ill.
Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.
Jarecki Mfg. Co., Erie, Pa.
Pneumatic Foundations
S. W. Frescoln, World Bldg., N. Y.
Portable Drills
Jas. T. Halsey, Philadelphia, Pa.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.
Publications
Colliery Engineer, Scranton, Pa.
Engineering Magazine Co. World Bldg., N. Y. City.
Poor's Manual, N. Y.
Pulleys
J. H. & D. Lake Co., Hornellsville, N. Y.
Pumps
Thos. Carlin's Sons, Allegheny, Pa.
Fairbanks, Morse & Co., Chicago.
Goulds Mfg. Co., Seneca Falls, N. Y.
Laidlaw & Dunn Co., Cincinnati, O.
Pulsometer S. P. Co., 120 Liberty St., N.Y.
R. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 86 Liberty St., N. Y.
Radial Taps
J. T. Connelly, Milton, Pa.
Rails
Bethlehem Iron Co., 60 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh Pa.
Rail Fastenings
Cambria Iron Co., Johnstown, Pa.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.
Rail Joints
Cont. Rail Joint Co. of Amer., New'k, N.J
Eno Rail Joint Co., Newark, N. J.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
McConway & Torley Co., Pittsburgh, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Price Rail App. Co., Phila., Pa.
Q. & C. Co., Chicago, Ill.
Railroad Castings.
Vulcan Iron Works, Toledo, O
Railroad Finance
Edward Morton & Co., 58 B'way, N. Y.
Railroad and Transp. Lines
Big Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.
Chicago, Rock Isl. & Pacific.
C., H. & D.
Hoosac Tunnel Route.
Illinois Central.
Kans. City, Ft. Scott & Memphis Ry.
Lehigh Valley R. R.
Michigan Central.
Missouri, Kansas & Texas Ry.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Philadelphia & Reading R. R.
Stonington Line.
Texas & Pacific.
Railroad Printing
C. F. Ketcham & Co., 25 Nassau St., N. Y.
Railroads, Building & Equipping
Godeffroy & How, New York.
Railroad Supplies
Bryant & Barbey, 79 Milk St., Boston.
Reginald Canning & Co., 115 B'way, N.Y.
Thos. Carlin's Sons, Allegheny, Pa.
Fairbanks, Morse & Co., Chicago.
Central Oil & Supply Co., 24 Whitehall St., N. Y.
The Johnson R. R. Signal Co., Rahway.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
G. D. Peters & Co., London, England.
Rail Saws
G. Ehrhardt & Sons, Pittsburgh, Pa.
Railway Varnishes & Surfacers
Flood & Conklin, Newark, N. J.
Murphy & Co., Newark, N. J.
Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Car Truck Supply Co., Chicago.
Reducing Valves
Curtis Regul. Co., 89 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.
Refined Iron
Falls Hollow Staybolt Co.
Refrigerator Cars
R. M. Pancoast, Camden, N. J.
Refrigerating Machinery
De La Vergne Refrig. Machine Co., N.Y.
Rivets, Slotted
J. L. Thomson Mfg. Co., Waltham, Mass.
Road Scrapers
Amer. Steel Scraper Co., Sidney, O.
Rock Ballast and Rock Breakers
Thos. Carlin's Sons, Allegheny, Pa.
Gates Iron Works, Chicago, Ill.
Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 23 Park Place, New York.
Rolling Steel Shutters
Jas. G. Wilson, 74 W. 23d St., New York.
Roofing
East. Gran. Roofing Co., Jersey City, N.J.
Roofs
Berlin Iron Bridge Co., E. Berlin, Conn.
Rolling Journal Bearings
Mencely Bearing Co., W. Troy, N. Y.
Rolling Stock to Lease
Oliver Adams, 32 Liberty St., N. Y.
Rubber Belting
N. Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Safety Valves
Ashton Valve Co., Boston, Mass.
Saw Mills
Richmond (Va.) Loco. & Mach. Wks.
Schools, Technical
Rensselaer Polytechnic Inst., Troy, N.Y.
Second-Hand Rolling Stock
A. S. Males & Co., Cincinnati.
Second Hand Steel Rails
W. H. Perry & Co., Providence, R. I.
Sewerage
J. J. R. Croes, 13 William St., N. Y.
Sewer Pipe
Blackmer Post Pipe Co., St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.
Shafting
Wm. Sellers & Co., Phila.
Signals.
Hall Signal Co., 50 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.
Kinsman Bl'k System Co., 143 Liberty St.
Mozier Safety Signal Co., Galion, O.
Nat. Switch & Sig Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh.
Wuerpel Sw. tch & Sig. Co., St. Louis, Mo.
Skylights
Valle & Young, 309 No. St. Baltimore, Md.
Snow Shovels and Plows
Jull Mfg. Co., Brooklyn.
Solid Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Speed Recorders
Dover Speed Recorder Co., Chicago.
Spikes
Dilworth, Porter & Co., Pittsburgh, Pa.
Q. & C. Co., Chicago.
Morris Sellers & Co., Chicago.
Central Oil & Supply Co., 24 Whitehall St., N. Y.
Springs
Farist Steel Co., Bridgeport, Conn.
A. French Spring Co., Pittsburgh, Pa.
Pickering Spring Co., Philadelphia.
Chas. Scott Spring Co., Philadelphia, Pa.
Stand Pipes
John N. Pouge, Cincinnati, O.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Fuller Bros. Co., N. Y.
R. M. Jones & Co., Boston & N. Y.
Steam Coupling
Moran Flex. Steam Joint Co., Louisv, Ky.
Steam Dredges
Bucyrus (O.) Str'm Shovel & Dredge Co.
Vulcan Iron Works Co., Toledo, O.
Steel Car Channels
Cambria Iron Co., Johnstown, Pa.
Steel—Musket's
R. M. Jones & Co., 11 Oliver St., Boston.
Steel Castings
Aetna Iron & Steel Co., Bridgeport, O.
Chester Steel Castings Co., Philad'a., Pa.
Congdon Brake Shoe Co., Chicago, Ill.
Eureka Cast Steel Co., Philad'a, Pa.
Norristown Steel Co., Norristown, Pa.
Sharon Steel Castings Co., Sharon, Pa.
Solid Steel Co., Alliance, O.
Pratt & Letchworth, Buffalo, N. Y.
Steel Centre Plates
Schoen Mfg. Co., Pittsburgh, Pa.
Steel and Iron Plates
Lukens Iron & Steel Co., Coatesville, Pa.
Wellman Iron & Steel Co., Thurlow, Pa.
Steel and Steel Tires
Latrobe Steel Works, Latrobe, Pa.
Midvale Steel Co., Nicetown, Phila.
Thos. Prosser & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.
Switches and Switch Stands
Allentown Rolling Mill, Allentown, Pa.
Barnum & Richardson Mfg. Co., Chicago.
Elliot Frog & Switch Co., E. St. Louis, Ill.
C. W. Hunt Co., New York City.
Johnston R. R. Frog & Switch Co.
Nat. Switch & Sig. Co., So. Bethlehem, Pa
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
Sheffield Veloc. Car Co., Three Riv., Mich
Union Switch & Sig. Co., Pittsburgh, Pa
Weir Frog Co., Cincinnati, O.
Wuerpel Switch & Sig. Co., St. Louis, Mo
Taps and Dies
D. Saunders' Sons, Yonkers, N. Y.
Manning, Maxwell & Moore, 111 Lib. St., N. Y.
Tanks (Cedar)
G. J. Burkhardt's Sons, Philadelphia Pa
Fairbanks Morse & Co., Chicago.
Tank Valves
John N. Pouge, Cincinnati, O.
Testing Laboratory
Pitts. Testing Laboratory Pitts'urgh, Pa.
Telegraph Call-Bell System
Electric Secret Service Co., N. Y. City
Gill-Alexander Electric Mfg. Co., Kansas City, Mo
Thermometers
Standard Therm. Co. Peabody, Mass.
Tie Plate and Brace
W. H. Phillips, Box 288, Phila.
Tie Plates
Central Oil & Supply Co., 24 Whitehall St., N. Y.
Q. & C. Co., Chicago.
Shoulder Tie Plate Co., Philadelphia, Pa.
Track Tools
Fairbanks, Morse & Co., Chicago
Metcalf, Paul & Co., Pittsburgh, Pa.
Transfer Tables
Industrial Works, Bay City, Mich.
Turn Buckles
Centr'l Iron & Steel Co., Brazil, Ind.
Cleveland (O.) City Forge & Iron Co.
Turn Tables for Railways
Cofrode & Saylor, Philadelphia, Pa.
Industrial Works, Bay City, Mich.
King Bridge Co., Cleveland, O.
A. S. Males & Co., Cincinnati.
Passaic Rolling Mill Co., Paterson, N. J
Wm. Sellers & Co., Phila. and N. Y.
Shiffer Bridge Co., Pittsburgh, Pa.
Valves
Ashton Valve Co. Boston.
Curtis Regulator Co., Boston, Mass.
Foster Engineering Co., Newark, N. J
Mason Regulator Co., Boston, Mass.
Ross Valve Co., Troy, N. Y.
R. D. Woods & Co., Philadelphia, Pa.
Varnishes
F. W. Devoe & Co., Fulton street, N. Y.
Flood & Conklin, Newark, N. J.
Murphy & Co., Newark, N. J.
Edw Smith & Co., Times Bldg., N. Y.
Ventilators
Car Ventilator Co., Phila.
Q. & C. Co., Chicago.
Washers and Rivets
Fuller Bros. & Co., 139 Greenwich St., N.Y
Water Columns
J. N. Pouge, Cincinnati, O.
Sheffield V. Car Co., Three Rivers, Mich
Water Meters
Thomson Hydraulic Co., New York City.
Water Purifier
Arthur Pennell, Kansas City, Mo.
Waterproof Insul. Papers
Standard Paint Co., 2 Liberty St., N. Y.
Water Supply
J. J. R. Croes, 13 William St., N. Y.
Wheelbarrows
Akron Tool Co., Akron, O.
Window Sash Cord
Samson Cordage Works, Boston, Mass.
Wire, Insulated
Okonite Co. (Ltd.), N. Y.
Wire Rope
Trenton Iron Co., Trenton, N. J.
Wood Working Machinery
Berry & Orton Co., Philadelphia, Pa.
Egan Co., Cincinnati, O.
J. A. Fay & Co., Cincinnati, O.
Greenlee Bros. & Co., Chicago.
John A. White Co., Dover, N. H.
S. A. Woods Mach. Co., Boston, Mass.
Wrecking Cars
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
Vulcan Iron Works Co., Toledo, O.
Wrenches
Billings & Spencer Co., Hartford, Conn
Rhode Island Tool Co., Providence R. I



LOCOMOTIVE LINK MOTION MODEL.

By this Model the principles of a Link Valve Motion and the distribution of steam in the Locomotive can be systematically studied, and what is equivalent to practical experience in setting valves and eccentrics obtained. It is as near like an every-day Locomotive as possible, each part occupying the same place as the engine itself. It has all the movements and adjustments of a regular Locomotive.

This is a Machine and not a toy.

SPECIAL CATALOGUE MAILED ON APPLICATION.

PEDRICK & AYER,

1001 & 1003 HAMILTON STREET,

PHILADELPHIA, PA.

SLAB MILLING MACHINES.
SPECIAL MILLING MACHINES.
HORIZONTAL BORING MACHINES.
CUTTER GRINDERS.

THE INGERSOLL MILLING MACHINE CO.
ROCKFORD, ILL. U. S. A.

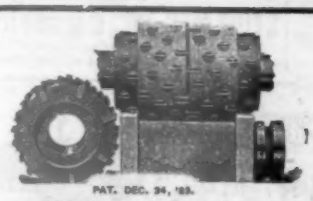
SIZES.

22 x 22 x 60".	Weight	10,000 lbs.
24 x 24 x 72".	"	16,500 "
36 x 36 x 96".	"	22,000 "

With our machines we guarantee to mill a specified number of any of the following named pieces in a specified time:

SHOES, WEDGES, DRIVING BOXES, TRUCK BOXES, CROSS-HEADS, SIDE RODS, CONNECTING RODS, VALVES, BRASSES, ETC.

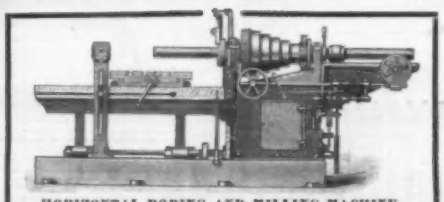
Write for our time on any of these pieces and compare it with your planers or other Milling Machines.



PAT. DEC. 24, '89.

MILLING CUTTERS.

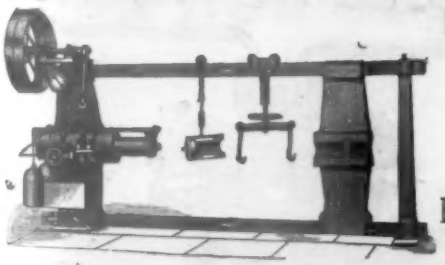
Any Diameter or Width for Milling any Shape.



HORIZONTAL BORING AND MILLING MACHINE.

Send for Descriptive Circular of this Machine, it has many improved features.

Hydraulic Tools for Railroads



IMPROVED CAR WHEEL PRESSES,

Both Hand and Belt Power.

Hydraulic Jacks.

From 4 to 150 Tons Capacity.

Hydraulic Crank-Pin Presses

For forcing out Crank-Pins.

HYDRAULIC VALVES, GAUGES, FITTINGS, Etc.

Piston-Rod Extractors, for starting Piston Rods from Cross-head.

LET US KNOW YOUR REQUIREMENTS.

WATSON & STILLMAN, Mfrs., 204, 206, 208 & 210 E. 43d St., N. Y.

HUBBARD ANTI-FRICTION SIDE BEARINGS.

One of the most effective and economical improvements ever made for car trucks.

Sample Free.

BOTTOM VIEW OF UPPER OR ANTI-FRICTION BEARING.

CAR TRUCK SUPPLY CO.,

1007 Monadnock Bui'ding, CHICAGO.

CAR-BUILDERS' DICTIONARY.

PRICE, $3 PER COPY.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE, 73 Broadway, New York.

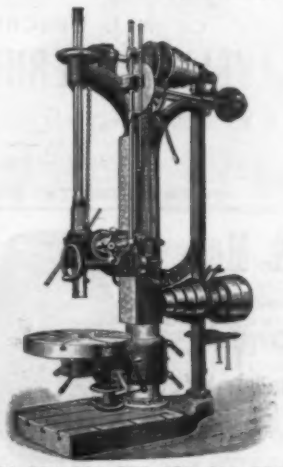
DRILL PRESS

FOR THE

RAILROAD SHOP.

WRITE TO

GOULD & EBERHARDT, Newark, N. J.



22", 25", 32", 37", 43", 48", 52".

JAMES T. HALSEY.

26th and Callowhill Sts., PHILADELPHIA

RICHARD DUDGEON

24 Columbia St., New York.

Maker and Patentee of

Improved Hydraulic JACKS.

PUNCHES, BOILER-TUBE EXPANDERS AND DIRECT-ACTING

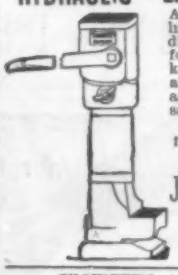
Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for Pressing on Car Wheels or Crank Pins made to order.

TANGYE'S

HYDRAULIC LIFTING JACK.



A good, reliable jack for lifting or pushing in any direction. The lever is for pumping it up, the key lowers and stops it at any point, when it is again ready for lifting, saving time and trouble

Various sizes made, from 4 tons to 200 tons.

Joseph F. McCoy Co

26 Warren St.,

NEW YORK.

ENGINEER'S AND FIREMAN'S

TIME. EXPENSE

AND

MEMORANDUM ACCOUNT BOOK.

DESIGNED AND COPYRIGHTED BY

E. W. YATES.

A pocket memorandum book with rubber tipped pencil attached, with calendar and pages most conveniently arranged for the engineer or fireman to keep his own daily record of time and miles run, rate and amount earned; also for individual expense account each month and for general memoranda. A certain method of checking with the timekeeper in case of disagreement. It lasts one year, and every engineer and fireman should have one. Price 50 cents each; $30.00 for fifty copies, or $35.00 a hundred. An agent wanted on each road.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE

73 BROADWAY, NEW YORK.

Open Hearth and Eureka **STEEL CASTINGS**

Railroad and Machine Work. Locomotive Cross-Heads a Specialty. Guar'nte'd Knuckles for M. C. B. Couplers

Address Eureka Cast Steel Company, CHESTER PA

STEEL SURFACE CATTLE GUARDS

—MANUFACTURED BY—

For Testimonials, Prices, Etc., Address

BUSH CATTLE GUARD CO., Kalamazoo, Mich.

HOISTING ENGINES.

Of any Power and Style, SINGLE AND DOUBLE CYLINDER, with improved patent friction drums especially adapted for all classes of work, Single and Double Drum, friction and direct geared, link motion MINING Engines, Four, six and eight spool, dock clutch, self propelling BRIDGE ERECTING Engines, Double cylinder, double friction drum DOCK BUILDING and PILE DRIVING Engines, Quick motion, friction geared COAL HOISTING Engines, Powerful compound geared and friction geared QUARRY Engines, WITH OR WITHOUT BOILERS. Any amount of reference given. Establishe 1870.

J. S. MUNDY, 20-34 Prospect St. Newark N. J.

DRAWING AND ENGRAVING

The *Railroad Gazette*, finding it necessary to increase its facilities for executing its own engravings, is now prepared to fill orders fo

ACCURATE
ARTISTIC
DRAWINGS AND
ENGRAVINGS

of all kinds working either from objects, photographs, blue prints or sketches.

ADDRESS
THE RAILROAD GAZETTE, 73 Broadway, N Y.

THE PRICE RAIL JOINTS.

—OFFERED BY THE—

PRICE RAILWAY APPLIANCE CO.

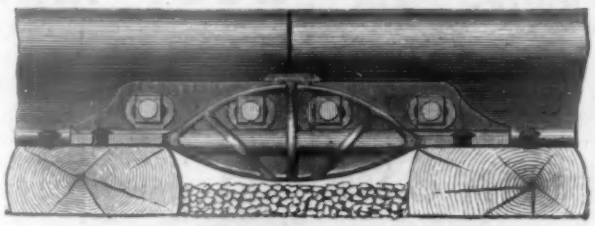
AVOIDING the LEVERAGE of the Usual SPLICE BARS.

(Covered by Several Applications in the Patent Office.)

These RAIL JOINTS can be made to fit any section or weight of rail to order, and will probably ESCAPE THE BREAKAGE of the SPLICE BARS.

They are THE DOUBLE GIRDER JOINT, THE SPOKE JOINT and THE RIBBED TRUSS JOINT.

THE DOUBLE GIRDER JOINT

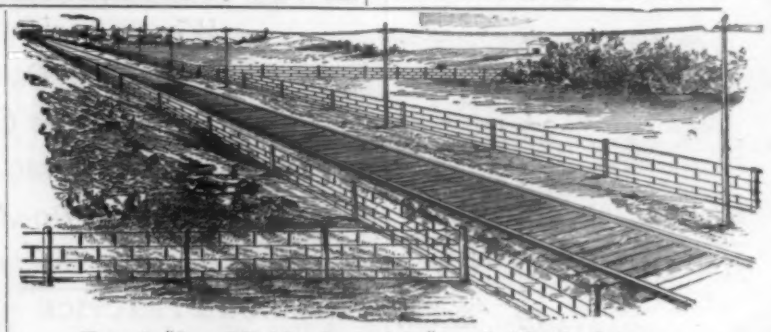


For a Remarkable TEST of This Joint, See The Railroad Gazette of October 14.

ENGINEERS, PURCHASING AGENTS and SUPERVISORS desirous of testing these Joints upon their own track will please address for further information

JAMES M. PRICE,

125 South Fifth Street, Philadelphia, Pa.



We use the "Duncan" Steel Stay-Guard and the "Australian" Stretcher-Fastener.

Barkley & House, Contractors and Builders of all kinds of RAILWAY FENCES, TELEGRAPH and TELEPHONE LINES.
1159 The Rookery, CHICAGO.

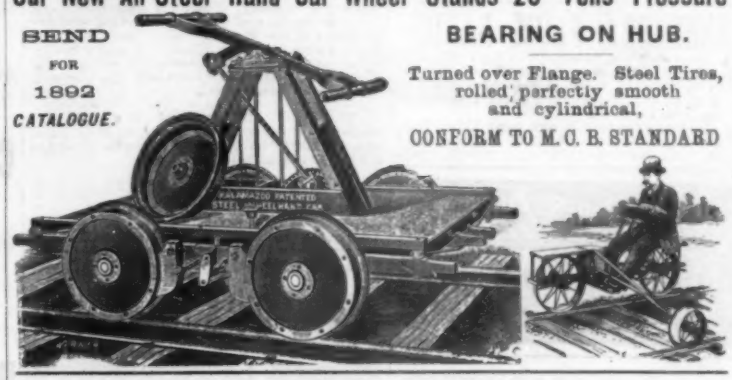
Kalamazoo Railroad Velocipede & Car Co.,

KALAMAZOO, MICH., U. S. A.,
MANUFACTURERS OF

Different Styles of Steel Velocipedes.
Steel-Wheeled Hand Cars.
Rail or Construction Cars.
Hand and Steam Inspection Cars.
Iron and Steel-Wheeled Push Cars.
Pit or Mining Cars.
Sugar-Cane Cars.
Steel Surface Cattle Guards.

Our New All-Steel Hand Car Wheel Stands 20 Tons Pressure BEARING ON HUB.

SEND FOR 1892 CATALOGUE.



Turned over Flange. Steel Tires, rolled perfectly smooth and cylindrical,

CONFORM TO M. C. B. STANDARD

STANDARD DRAWINGS, on Card Board, Car Axle Journal-bearing; Journal and Pedestal. Price, 30 cents each.

SCALES FOR TURNOUTS By E. A. GIESELER. Gives graphically the frog numbers length of lead and degree of curvature for turnouts from 3° to 42° 30'. Stiff card board pocket size. More convenient and certain than tables. Price, with full directions for use 25 cents. THE RAILROAD GAZETTE, 73 BROADWAY, N. Y.

11 Original and Controlling Patents for Sloping Metal Slats. 4 Styles.

STANDARD CATTLE GUARDS

LARGELY PURCHASED BY OVER 30 RAILROADS.

Made of Tested Steel—New Principle Involved. Address 39-41 W. Washington St., Chicago, Ill.

The advantages of the Gorham Crossing Gate are briefly as follows:

1. It is simple, durable, has few parts, and can be easily understood and operated by any gateman.

2. It will adapt itself to any street crossing, and can be operated from any desired position, distance or height.

3. We guarantee that it will not freeze up.

4. Expense of repairs is reduced to a minimum.

GORHAM PNEUMATIC CROSSING GATE.

ROOKERY BUILDING,
CHICAGO, ILL.

Correspondence Requested and Price Lists Sent Upon Application

In order to introduce this Gate the Company is prepared to make the following offer:

To any railroad or responsible firm it will furnish or erect a complete set of their Gates upon a six months' trial. All the railroad is required to do is to prepare the necessary foundations. If at the end of the time agreed upon the Gorham Crossing Gate does not give complete satisfaction it will be at once removed, and any outlay incurred in preparation of foundation returned. All we ask is a fair and impartial trial.

N. B.—If you are looking for a Stock Guard that combines all the essential parts of a good Guard, i. e., More Material, Careful Construction, Efficiency, Strength, Durability, and at a Comparatively Lower Cost than any other Metal Guard, send for Descriptive Circulars of Merrill's Patent Steel Stock Guard.

MERRILL-STEVENS M'F'G CO., NILES, MICH.

RAILROAD GAZETTE

Published Every Friday at
73 Broadway, N. Y.

$4.20 PER YEAR TO UNITED STATES AND CANADA.
6.08 " " " FOREIGN COUNTRIES.

Express money orders, or drafts, or P.O. orders or registered letters should be made to the order of the RAILROAD GAZETTE.

EMPLOYMENT.

A RAILROAD MAN, 32 YEARS OLD, who has been office boy, operator, dispatcher and trainmaster, has just resigned the latter position. He would like to take a division, as Superintendent, but would take something less. Address P., *Railroad Gazette*

RAILROAD SUPPLY MAN DESIRES a connection with a reliable manufacturing or mercantile establishment handling railroad supplies, either by engagement or by purchasing an interest. Has had fifteen years experience in superintending men, traveling and dealing in railway supplies, and has a large acquaintance among mechanical railroad men. Satisfactory reason for changing business. Principals only address in strict confidence PALISADES, care *Railroad Gazette*, 73 Broadway, N. Y.

WANTED AND FOR SALE.

RAILS AT A BARGAIN.

We own and offer for sale, cheap, 450 tons of selected second-hand 30-lb. IRON RAILS in Chester County, Pa., all in good condition; also 132 tons of new, first quality, 50-lb. STEEL RAILS at Steelton, Pa. Write or wire us.

ROBINSON & ORR,
No. 419 Wood St., PITTSBURGH, PA.

FOR SALE.

two Marion Steam Shovels, 100 Dump Cars, 3 Locomotives, Ballast unloader, Rails 30 and 60 lbs. in order to relay, Hoisting Engines, Road Rollers, Pumps, Crushers, Boilers, Condensers, Compressors, Tanks all sizes, Drills, Scrapers, Dredges, Pile Drivers, four million gallon compound Duplex Pump, Contractors Tools second hand in good order, Ice Machinery and Water Purifiers. **W. S. MIDDLETON,**
52 John Street, New York.

FOR SALE.

One combination passenger and baggage car and two passenger coaches—standard gauge; equipped with Westinghouse brakes; nearly new; immediate delivery.

Two open excursion cars, seating 85, for sale at a bargain.

HUMPHREYS & SAYCE,

10 WALL ST., NEW YORK.

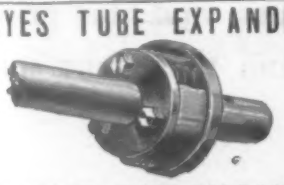
FOR SALE.

300 tons 30-lb. steel T-rails and angle bars in excellent condition; Western delivery.

D. E. GARRISON & CO.,
Railway Equipment,
St. Louis, Mo.

RELAYING RAILS FOR SALE, Cheap.—3,000 tons Iron Tees with fastenings, from 28 to 56 pounds, deliveries September and October. 200 tons of 52-pound Johnson Girder Rails. In the market to buy old railway material. L. K. HIRSCH, 549 Rookery, Chicago, Ill.

HAYES TUBE EXPANDER



TRIPLE EXPANSION

BY ROLLER PROCESS
Makes the Best Setting.
Recommended by U. S. Government.

HAYES TOOL CO.,
41 & 43 CROSS ST.,
PORTLAND, MAINE.

WE HAVE IN STOCK

One 16 × 24 in. Standard Gauge Road Engine.
One 15 × 20 in. Standard Gauge Shifting Engine.
One 7 × 12 in. Three-Foot Gauge Saddle Tank Engine.
Hoisting Engines and Machinery and Contractors' Outfits.

THOMAS CARLIN'S SONS,
Allegheny, Pa.

CAR-BUILDERS' DICTIONARY,
Price, $3 a copy.

LOCOMOTIVES, BOILERS, RAILS, CARS, STRUCTURAL MATERIAL, BRIDGES. **INSPECTION** R. W. HILDRETH & Co. 2 WALL ST. NEW YORK.

THE NATIONAL AGENCY

FURNISHES MANUFACTURERS WITH
Chemists, Civil or Mining Engineers
FREE OF ALL EXPENSE.
Address 1015 Arch St., Phila., for our pamphlet

ESTABLISHED 1890.
The Engineering Employment Bureau,
GRANGER BLOCK, SYRACUSE, N. Y.,
Furnishes Employers with **Engineers, Superintendents, Chemists and Draftsmen, free of charge.**
The first agency established for furnishing Engineering Help, exclusively.
Prompt—Honest—Experienced.

VAILE & YOUNG'S Patent Metallic Skylights.

HALF SIZE.

Without Putty. Construction adapted to all forms and styles of Skylights. Thousands of feet in use have proved its superiority. Particularly adapted for Depots, Mills, Factories, etc., where large and continuous lights are required. Send for Illustrated Catalogue.

216 N. Calvert St., Baltimore, Md.

GEO. L. FOWLER,
Mechanical Engineer,
53 Broadway, New York.
Special attention given to Designing, Testing and Constructing Railroad Machinery and Rolling Stock.
Sole Agent for Hale's Locomotive Ashpan.

J. JAMES R. CROES,
M. Am. Soc. C. E.; M. Inst. C. E.,
13 William Street, New York City,
CONSULTING ENGINEER.
Examinations and Reports made on Projects for Water Supply and Sewerage of Towns, Rapid Transit and River Improvements.
Plans and Specifications prepared and Work of Construction superintended.

J. A. L. WADDELL,
Consulting Bridge Engineer.
Superstructure, Substructure, Borings, Train Sheds, Designs, Estimates and Superintendence. Expert Examination of Old Structures.
Keith & Perry Bldg., Kansas City, Mo.
Branch Office, Room 945 "The Rookery," Chicago, Ill.

Member Am. Soc. Civil Engineers.
Member Am. Inst. Mining Engineers.
Associate Am. Inst. Electrical Engineers.
FREDERICK H. SMITH,
Consulting Engineer & Geologist, Bridge Engineer
227 E. German St., Baltimore, Md.

VON SCHON & GARNER, Civil Engineers
FREDERICKSBURG, VA.
Examination of railroad projects and property; surveys and locations of railroads. We operate throughout the South. Estimates free.

A. LEOFRED,
GRADUATE OF LAVAL AND McGILL.
MINING ENGINEER
Main Office: QUEBEC.
BRANCHES: SHERBROOKE, MONTREAL, 17 Place d'Armes Hill.
MINES, MINERAL PRODUCTS.

ESTABLISHED 1830.
PATENT TRANSITS
YOUNG & SONS,
Engineering Instrument Makers,
43 NORTH SEVENTH STREET,
Philadelphia.
Tapes, Chains, Draughting Instruments. Catalogues on application.

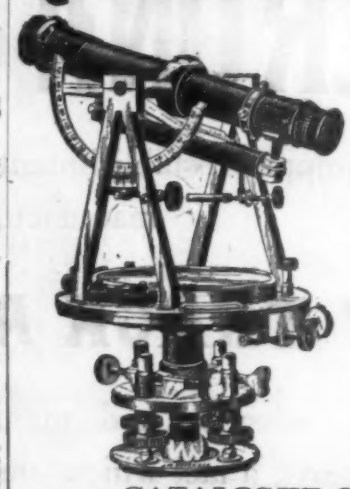
THE NEW HIGH EXPLOSIVE

RACKAROCK

Furnished in two ingredients which are absolutely unexplosive until combined by the consumers, for which we furnish convenient means. Shipped and stored as ordinary merchandise. After combination the explosive absolutely safe. By reason of its safety it is especially adapted to water-works construction in crowded streets.

Rendrock Powder Co.
23 PARK PLACE, NEW YORK.

QUEEN & CO., PHILADELPHIA.



MANUFACTURERS OF
Engineers', Surveyors' and Draughtsmen's Supplies.

Improved Complete Engineers' Transit.

Power of telescope, 24 diam. Compound long centers. Two outside verniers. Five-in. needle. Level to telescope, vertical arc, clamp and tangent and the usual accessories. Complete with box and tripod. **PRICE, $180.**

ENGINEERS' PLAIN TRANSIT.

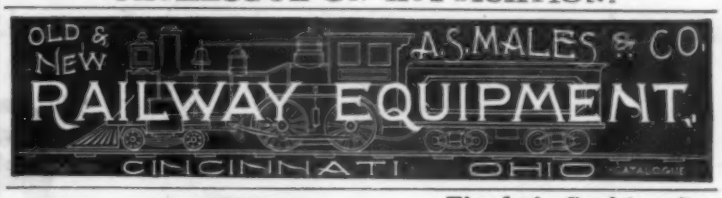
Same as above, without level, arc or clamp and tangent. **PRICE, $150.**

Improved Engineers' Wye Level.

Telescope, 18 or 20 in. Power, 40 or 50 diameters, as desired. Shifting center. Complete with box and tripod and usual accessories. **PRICE, $110.**

Any of these instruments sent on approval, with privilege to return if not satisfactory.

CATALOGUE ON APPLICATION.



Flood & Conklin Co.
VARNISH MAKERS
NEWARK, N. J.

Railway Varnishes and Surfacers
A SPECIALTY.

CHARLES H. BRIGHTLY.

TRADE MARK.

Late of HELLER & BRIGHTLY,
MANUFACTURER OF
Mathematical, Engineering and Surveying INSTRUMENTS.
Germantown Junction, P. R. R. 16th St. Station, P. & R. R. R.
PHILADELPHIA, PA.

CHARLES S. HELLER (ESTABLISHED 1870.)

TRADING AS
HELLER & BRIGHTLY,
MANUFACTURERS OF
ENGINEERING, MINING AND SURVEYING INSTRUMENTS,
Cor. SPRING GARDEN STREET and RIDGE AVENUE,
PHILADELPHIA, PA.

Marshall M. Kirkman's Books.

The following is a correct list of M. M. Kirkman's books now in print Those not mentioned are out of print.

"How to Collect Railway Revenue without Loss"	$2.50
"Treatise on the Method of Paying Large Bodies of Men"	1.00
"The Track Accounts of Railroads: How They Should be Kept"	1.00
"The Handling of Railway Supplies" and "Rules and Regulations Governing Requisitions"	2.00
"Baggage, Parcel and Mail Traffic and Accounts"	2.50
"Care of Cash by Agents and Conductors and Accounts Connected Therewith"	2.00
"Handbook of Freight Traffic and Accounts"	2.00
"Handbook of Passenger Traffic and Accounts"	2.00
"Railway Rates and Government Control"	2.50

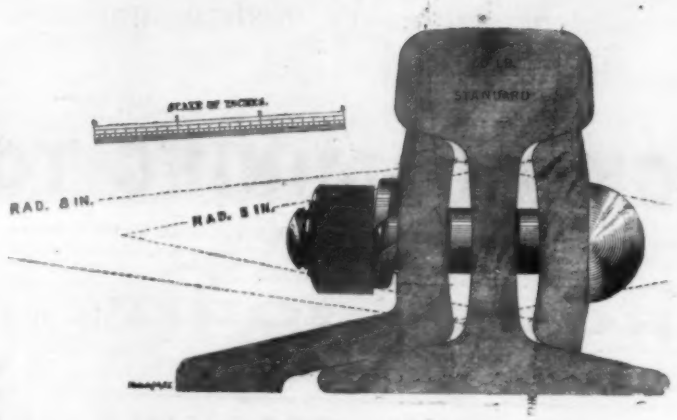
Mailed, Postage Prepaid, on Receipt of Price

For Sale by THE RAILROAD GAZETTE, 73 Broadway, New York

D. A. HOPKINS MFG. CO. LEAD-LINED JOURNAL BEARINGS AND BRASS CASTINGS

CENTRAL BUILDING, 143 LIBERTY ST. N. Y.

THE VERONA NUT LOCK.



PATENTED
February 4, 1868.
April 28, 1869.
September 28, 1869.
March 21, 1876.
September 15, 1885.

THE VERONA NUT LOCK was first introduced to the railway public in 1875, seventeen years ago. It at once commended itself to railway managers, engineers and track masters as a remarkably simple and effective device for taking up the wear due to imperfect contact and abrasion of rail and splice, and for its positive action in locking the nut. That it continues to be highly regarded for the purposes named is shown by the sales of 1892, which up to date exceed *thirteen millions*, making the grand aggregate of sales fully

TWO HUNDRED MILLIONS.

This vast number has equipped more than 140,000 miles of track, and has required in its manufacture more than twelve million pounds or 6,000 tons of steel. Nearly every railroad in the country has used it to a greater or less extent at one time or another, while many of the best equipped roads of the country have maintained it as a standard from the time it was first brought to their notice up to the present. It has been modified in minor points from time to time, but in its general features and in its simplicity and effectiveness

IT CANNOT BE IMPROVED UPON.

The attempt to do so merely emphasizes by contrast its superiority to the various overloaded imitations of this originally perfect device.

Its use more than repays its cost in prevention of low joints and battered rail ends, while

COMPETENT ENGINEERS EVERYWHERE RECOMMEND IT.

And point to its value in the maintenance of a perfect and noiseless track.

VERONA TOOL WORKS,

PITTSBURGH, PA. VERONA, PA. CHICAGO, ILL.

omer,
Spie-
Iron
Wire
apes.

S

treet
s, Mo.

Y,

S.

eel,
Man.

O.

ter
in.

rk.
ng.

W

AFT
in

CENT
HALL
for th
TRAFF
GRAN
CROS

COMP
block
consi
signa
switc

T

ILLIAM

KIN

We mig
higher rat

WE D

THI

This d
handle **al**
none tha
large m
great econ
The ap
road shop
A trial

Office:

New Engl
SHERBUR
No. 53 Olive

Four
ends, and
of track.

The
A holdi
fiber. E
PHOTO

W

TO KI

CO'S

ALS

ve roads
ngs at a
ng beer

AINTAIN-
ROSSING
INSIGNIF-
RVICES OF
EING RE-
A GREAT
SE APPLI-
ECT EFFI-

ke a test
to notify
hem for a

NY,
Chicago.

RAILROAD GAZETTE

FRIDAY, NOV. 25, 1892.

CONTENTS.

Contributions.

Tests of Staybolt Iron.

Baltimore & Ohio Railroad Co.,
PITTSBURGH, Pa., Nov. 15, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read in your issue of Nov. 11, 1892, the results of tests of stay bolt iron made by the R. W. Hunt Co.

I think we can "go them a little better," for only to-day I tested some ⅞-in. S. B. iron, made by Jones & Laughlins, and give data herewith:

Section before break	.89	Area original	.6221 sq. in.
" after fracture	.68	" reduced	.3421 "
Elastic limit, lbs	21,000	Per sq. in.	33,750
Tensile strength, lbs	32,000	"	51,440
Elongation in 8 in	2.10 in. = 26.25 p. c.		
Reduction of area	45 "		

Cup shaped fracture and solid.

I often get staybolt iron that pulls up to 52,000 tensile strength per square inch.

L. A. SHEPARD, B. & O. Inspector.

The Frost Light on the Pennsylvania.

The Railroad Lighting and Manufacturing Co.,
PHILADELPHIA, Pa., Nov. 11, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice an article under the caption of "Car Lighting" on page 866, in your issue of Nov. 18, that would have a tendency to make railroad men doubt the fact that the Pennsylvania Railroad Co. had adopted our car lighting system as its general standard, and that we have not recently received an order from them for a great number of equipments; also that a new carburetor is to be used in the future, which is to be square instead of round.

Regarding the general adoption of our car lighting system by the Pennsylvania Railroad Co. as its general standard, would say this has been done, and we have a very large order in hand for over 500 cars, which is to be filled as quickly as possible. They have been using our square carburetor for at least three years in place of the round; in fact, they adopted it as their standard as soon as we perfected it. We have made no round carburetors for them or anyone else for at least three years.

Further, we have entered into a contract with the Pennsylvania Railroad Co. for the equipment of their sleeping, dining, parlor, passenger and all other cars of miscellaneous character for their entire system east and west of Pittsburgh. This contract when completed will amount to about $1,000,000. MERLE MIDDLETON,
Vice-President.

Concerning Nut Locks.

BROOKLYN, N. Y., Nov. 21, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article on lock nuts in your issue of the 11th inst. is of much interest to railroad men, giving them as it does means for comparing the many styles in use. There are some things inferred which may well cause us some serious thought, and I would like to note a few which occur to me.

In speaking of the spring washers generally you say: "It may be as well to say that the efficiency of any washer of this class depends very largely upon its being made of an excellent quality of steel, of high elastic limit, adding in another place. "One defect of the spring washer type of nut lock is, of course, the liability to overload the spring to such a degree as to entirely destroy its elasticity, when it becomes simply a flat washer, and its use as a lock is then lost." In view of the sharp competition of to-day, may we not question whether we get this "excellent quality of steel?" And as we know nuts do get loose and come off even with the spring washers on the bolts and that locks are then nearly devoid of any spring, might we not fairly use the word probability in place of liability?

A point is made in many cases of the sharp edges cutting into the nut and plate, and cuts are given showing that this action does take place. I will not take the time and space to argue that this action is an injury to the to the track, but calling attention to the cuts showing the effect on the nuts, would like to note that in all cases the metal forced out of the nut in screwing it up is piled on the raised surface on the washer. This means that the nut is prevented from turning forward on the bolt while the washer has scraped a grove in the nut, through which the projections on the washer can easily pass when the nut begins to loosen.

The forcing of a fin into the thread inside the nut makes what might be called a weld or union of bolt and nut, in which case the bolt becomes much like a rivet whose head may not come off, but which will become loose, and this looseness can be repaired successfully only by renewal.

The standard objections which are made to most lock nuts, the deterioration of the lock nut itself or the damage it does to nut, bolt or plate, seem to be eliminated in the case of Young's patent reversible nut lock which appears to be indestructible, cannot injure either nut, bolt or plate, and through the force of gravity, ever tends to tighten up the nut. A. T. T.

Fraser River Bridge, Canadian Pacific Railway, Mission Branch.*

To render the following description of the bridge over the Fraser River on the Mission Branch of the Canadian Pacific Railway intelligible, it is necessary to offer a few words of explanation as to the location and the reasons therefore.

The Fraser River, after following a course nearly due south for 300 miles, breaks through the Cascade range of mountains by the Yale Cañon and continues on the same course to the village of Hope about thirty miles from the boundary of the United States (49th parallel). It then turns sharply to the west and flows in that direction for about 100 miles in a wide alluvial valley, till it empties into the Strait of Georgia. This is known as the Lower Fraser and the lands on either bank are very fertile, forming the best agricultural district in British Columbia. The main line of the Canadian Pacific Railway follows the right bank of the Frazer to Port Hammond, while it turns northward to Burrard Inlet and the city of Vancouver, while the Westminster Branch diverges to the city of that name situate on the Frazer, about 20 miles from its mouth. To connect the Canadian Pacific with the railway systems of the state of Washington, Mission Station, about 40 miles from Vancouver, was selected as the most suitable point from which to branch off to the south, and the Fraser River had therefore to be crossed in that neighboorhood. The actual site of the bridge was selected in the longest straight reach in that part of the river. It is there a considerable depth all the way across—1,600 ft. wide at high tide level, 42 ft. deep near the north, and 25 ft. deep near the south bank. A short distance above the bridge it is 200 ft. narrower, and a similar distance below, 200 ft. wider. In winter there is 6 ft. of tide, which decreases gradually for about 25 miles farther up, where it ends. Freshets usually occur in June or July, and have risen as much as 17 ft., continuing in flood for a couple of months. With these characteristics it was hoped that there would not be much trouble with ice or driftwood, and that the bottom would be less likely to scour than elsewhere. Also that the water would not be dammed up to any appreciable extent by the piers, for on the south bank is a dike 6 ft. high, which reclaims from the overflow of the river about 10,000 acres of magnificent land. This dike was completed in the winter of 1889-90 under the superintendence of Mr. G. A. Keefer.

The bottom is of silt, which is probably of great depth, for the valley from Hope downward has evidently at no very distant (geological) period been one of the great fiords or inlets which reach from the Pacific Ocean, far into the Cascade range of mountains, and are found all the way from Puget Sound to Alaska.

These inlets are exceedingly deep, and this one, which has been filled up during the lapse of ages by the silt brought down by the Fraser River, was no exception to the rule.

The work was started rather hurriedly, only four days being taken to prepare a plan and specification, and contractors having only three days in which to tender; nevertheless the work has not been materially altered since its commencement. The viaduct is of wood, 3,000 ft. long, and consists of pile trestle approach 150 ft., one span 100 ft., seven spans 150 ft., swing truss 230 ft. over all, one span 150 ft., and 1,250 ft. of pile trestle approach. Howe truss spans of 150 ft. each were selected as being the largest which it is desirable to build in wood.

The chief difficulty lay in designing piers of moderate cost, which should be safe in winter when there is 35 ft. of water, a current of 2½ miles an hour, and at times ice which shoves at great force, and in summer when there is 50 ft. of water, a current of five miles an hour and driftwood coming in tangled masses, sometimes nearly an acre in area, as well as trees of great size.

Piers were originally proposed with four rows of piles placed at 2 ft. centres both ways, but the piles averaging 55 ft. in length the butts were so large that it was found impossible to drive them so close together, and consequently only three rows could be used, placed 3 ft. centres across the current, that is in the line of the bridge, and 2 ft. centres up and down stream. Around these piles cribs were built of square timber, with ties 9 ft. apart, for which spaces were left between the piles. The cribs are 11 ft. wide outside measurement, and 41 ft. long, with noses at each end projecting 5½ ft. farther and meeting in a right angle. Ballast chambers were formed between the ties in two of the spaces—the centre row of piles being left out—and the cribs were sunk as built. When they reached the bottom they were filled to the top with rock small enough to sink between the piles and form a solid mass. Rip-rap was then placed on the outside, 8 ft. deep next the cribs and extending 50 ft. in all directions from them.

Some difficulty was experienced in sinking such a large mass of timber with small ballast chambers, and in some cribs ties near the bottom were allowed to extend 6 ft. outward and two ballast platforms formed on each side, which arrangement was convenient for sinking the cribs during construction, but cannot be recommended where the bottom is soft, as in the present instance, as the surrounding rip-rap in settling into the mud fell away from the platforms, leaving a space through which the current scoured the material underneath to some extent before it was noticed and remedied.

The piles are driven about 20 ft. into the bottom of the river, and are cut off at the level of high water neap tides, being thus wet to the top twice every day. The cribs are built to the same height and are expected to last for a very long time, as the water is fresh, very cold and not known to be inhabited by any noxious insects. Resting on the piles are piers formed of framed bents 25 ft. in height, which places the bridge seat just 80 ft. above the highest flood known, viz., that of 1882. These have cut waters with a slope of 1 to 1.

Two of the framed piers were in position before the flood of 1890, and one of them was tested by a boom of logs descending the river, which a tug was unable to control. They were of long lengths, many of them four ft. and upward in diameter, and struck with such force as to slide up the cutwater several feet without jarring it in the least.

The Drawbridge.—For reasons which it is unnecessary to discuss here the swing has been built with an opening of 100 ft. on each side of the pivot pier, and far enough from the shore to give 24 ft. of water in one channel and 19 ft. in the other. This pier is 30 ft. in diameter, and being placed so far out in the current has caused a good deal of scour, so much so that the bottom of each channel has to be riprapped right across and for a considerable distance up and down the stream. The substitution of mattrasses of brush for the riprap, or a portion of it, was fully considered, but owing to the depth of water and rapidity of the current it was feared that difficulty would be experienced in sinking them exactly where required. It was found, moreover, that the amount of riprap necessary to insure their remaining permanently in position would bring the cost up to a higher figure than the riprap alone.

The swing truss and gear were designed by Mr. P. A. Peterson, the Chief Engineer of the Canadian Pacific Railway Company, and has an arched upper chord, 50 of the sticks in which are about 6 × 12 in., and from 78 to 97 ft. in length. These are of Douglas fir, sound and almost clear, and were sawn by one of the mills at Vancouver.

As a further instance of the facilities afforded by the timber of British Columbia for special classes of bridge work, it is worth mentioning that all the piles used in the false works of this bridge reached up to the lower chords, and ranged from 70 to 85 ft. in length.

DISCUSSION.

Mr. E. P. Hannaford said that an uneven number of panels in a Howe truss bridge was an evident error, as it did not permit the main braces meeting in the centres of the spans as they should do, and it left the centre panels without sufficient bracing. He observed that with the exception of the swing bridge and one fixed span, the remaining spans of 150 ft. each were arranged with uneven number of panels.

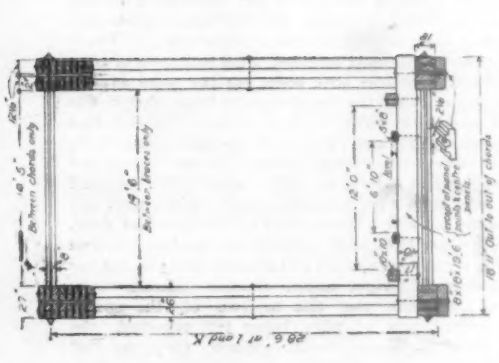
Mr. J. W. McCarthy said that Mr. Hannaford remarks that in the Howe truss mentioned by Mr. Cambie, the panels being uneven show a faulty design and not at all good practice. This is not the case, and it is not, in his opinion, a question to an engineer in dividing up a Howe truss whether the panels will be even or uneven. In designing a Howe truss, like any other truss, the first thing to decide is the length of panel. Now, should the panels be even, the main braces will abut at the top chord prism at centre of truss; if the panels are uneven the braces in this middle panel become counters. There are cases where even number of panels are most generally used, and that is in trusses which have a single system of bracing.

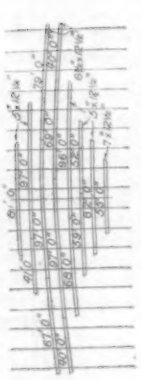
Mr. W. J. Sproule said that information on the following points, which Mr. Cambie can no doubt add to his interesting paper, will be of value:

1. The elevation of the Fraser River at the site of the bridge above sea level. This is of deep interest in connection with the rise of the tide and the currents developed by freshets, especially of such as rise 17 ft. above normal level of the river.

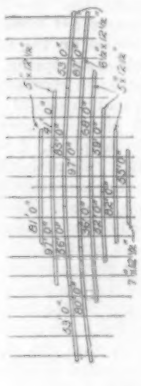
2. More particulars of the river bed. It is said to be of

* From a paper by H. J. Cambie, M. Can. Soc. C. E. Published in the *Transactions* of that Society.



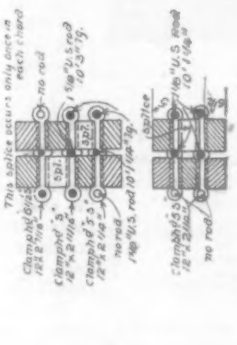


Up-stream Half of Each Top Chord.



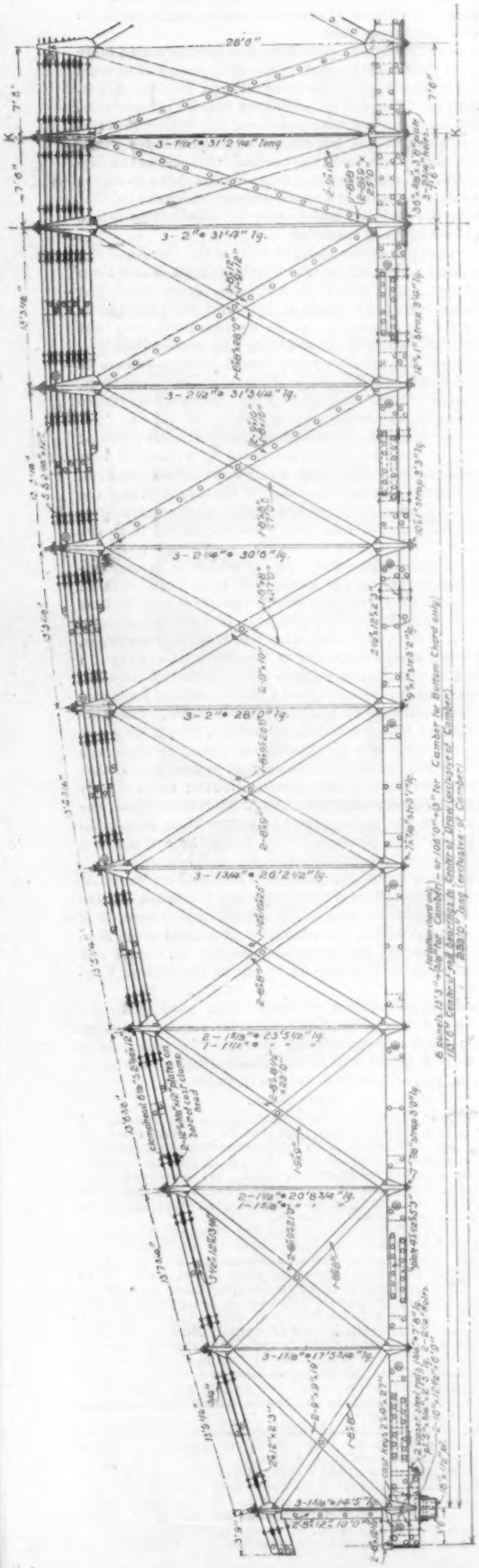
Down-stream Half of Each Top Chord.

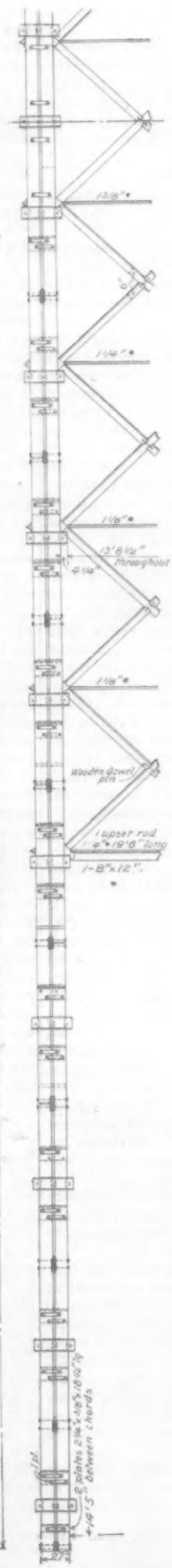
Diagram of Splicing.

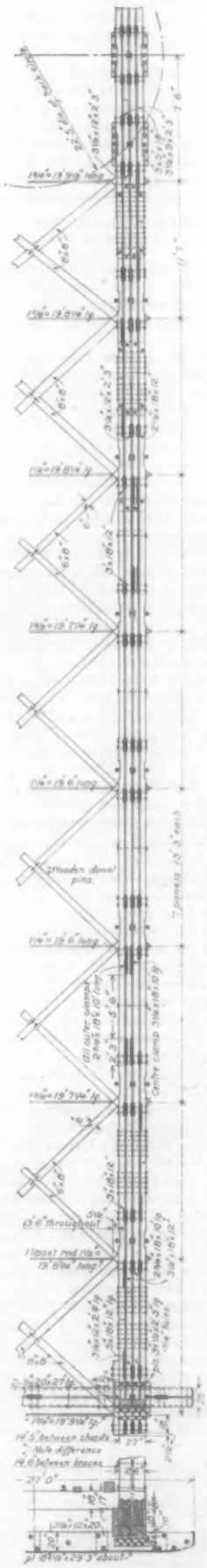


This splice occurs only once in each chord.

Section through Splice.







HOWE TRUSS DRAW SPAN WITH ARCHED TOP CHORD, FRASER RIVER BRIDGE—CANADIAN PACIFIC RAILWAY.

Elevation, Plans and Sections of Half of Draw Span—Length of Swing Span, 233 ft.

Designed by P. ALEX. PETERSON, *Chief Engineer.*

"silt," "probably of great depth." What is the nature of this silt? Is it very soft, or medium, or heavy silt? What is its depth? Have any borings or tests by bars or other means been made to ascertain its character or depth?

3. Additional details of the piers. Apparently the superstructure is supported entirely on the piles, and the cribwork is merely a casing to protect the piles from abrasure by ice or driftwood. Is this the case, or are the superstructure piles and cribwork all bound together? If the latter, how was the settlement of the cribwork arranged for? Settlement would probably take place in such a soft bottom, and the cribwork might continue settling for some time.

4. Did the scour mentioned as occurring in the swing spans take place at the normal state of the river or during a freshet? If the latter, was it a high freshet or a moderate one?

5. From the spans and dimensions of piers and rip-rap it is seen that the normal cross-section of water-way is decreased about 18 per cent., while the wetted perimeter is increased nearly 40 per cent. This interference with the discharging capacity of the river must to a certain extent increase the current in parts of the remaining water-way, and is important in the case of an unstable bed and may become serious in case of extraordinary freshets.

Mr. H. J. Cambie, in reply to Mr. Sproule, stated that:

1. There has not been any occasion in connection with the railway works to observe the tides very accurately at the bridge, but it is known that tidal high water there is about $\frac{1}{2}$ ft. higher than at Burrard Inlet on salt water, and that during spring tides there is only a rise and fall of 6 ft., while at Burrard Inlet on similar occasions there is $16\frac{1}{2}$ ft.

2. The silt deposited in the tidal portion of the river is heavy, but extremely fine, and when protected from scour forms a fairly solid bottom. Many of the piles which were driven 20 ft. into it, did not even when first entered, go more than four inches to each blow of a 3,000 lb. hammer falling a distance 8 ft., and offered more and more resistance as they went down.

There is no record of any boring having been made to ascertain the depth, but the configuration of the ground is such as to suggest its being great. And there are lakes which appear to have been arms of the inlet referred to, which are of great depth. The silt brought down by the Fraser filled up the main valley but could not reach into the side ones, thus Harrison Lake is known to be deep, and Pitt Lake is shown on the Admiralty charts with soundings of 200 to 450 ft., although the outlets to the Fraser are shallow.

3. The superstructure is supported entirely on piles, the cribs filled with stone being used principally as a means of bracing the piles together, though they are also a protection against ice and drift logs. The cribs are not bound in any way to the piles, nevertheless they have not settled perceptibly. The stone filling sank about 4 ft. in three months, was made up again, and has since remained stationary.

In the same way the riprap round the outside of the piers settled from 4 to 6 ft., was partly filled up again and seems to be now quite solid.

4. The scour in the swing spans took place during the freshet of 1890, which rose $12\frac{1}{10}$ ft. above the highest tide. It came up suddenly in the month of May, nearly a month earlier than usual, immediately after the cribs had been sunk and before any considerable quantity of riprap had been placed round them. The highest known freshet (that of 1882) was $3\frac{2}{10}$ ft. higher than that of 1890.

5. During freshets, such as that of 1890, the water-way is reduced just about 10 per cent., and the current is perceptibly increased between the piers, but no effort has been made to ascertain the rate. Four of the piers have now stood the freshets of three seasons without any injury, and the others for two seasons, so that the structure may be considered satisfactory.

Hydraulic Power for Railroad Terminals.

A valuable addition to the study of the very interesting commercial and engineering questions involved in the rearrangement of the railroad terminals in Chicago was made by Mr. George H. Reynolds in the Report of the Chicago Terminal Commission which was issued last summer. Mr. Reynolds' part in this report is in the form of a letter from him to Mr. John A. Roche, Vice-President of the Crane Elevator Co. It appears that Mr. Reynolds was sent to England, France and Scotland by the Crane company to investigate and report on the subject of railroad terminals, and the methods employed for handling cars, freight and passengers. He spent something like six weeks in these countries, and during this time visited the principal railroad stations in England and in Paris, all of the principal docks of London and Liverpool and many other important establishments. Some of the results of his notes are given in his letter to Mr. Roche, which follows nearly in full. We have made a few slight changes in phraseology and cut out a few paragraphs, but generally have followed Mr. Reynolds' text.

This communication is intended only as a preliminary report upon the terminal railroad systems as they are arranged and operated in the countries named, and is based upon my personal observations and knowledge gained from the railroad officials and from the workshops where the operating machinery of these terminals has been built.

Railroad Terminals.—These terminals in all of the principal cities may be divided into three classes:

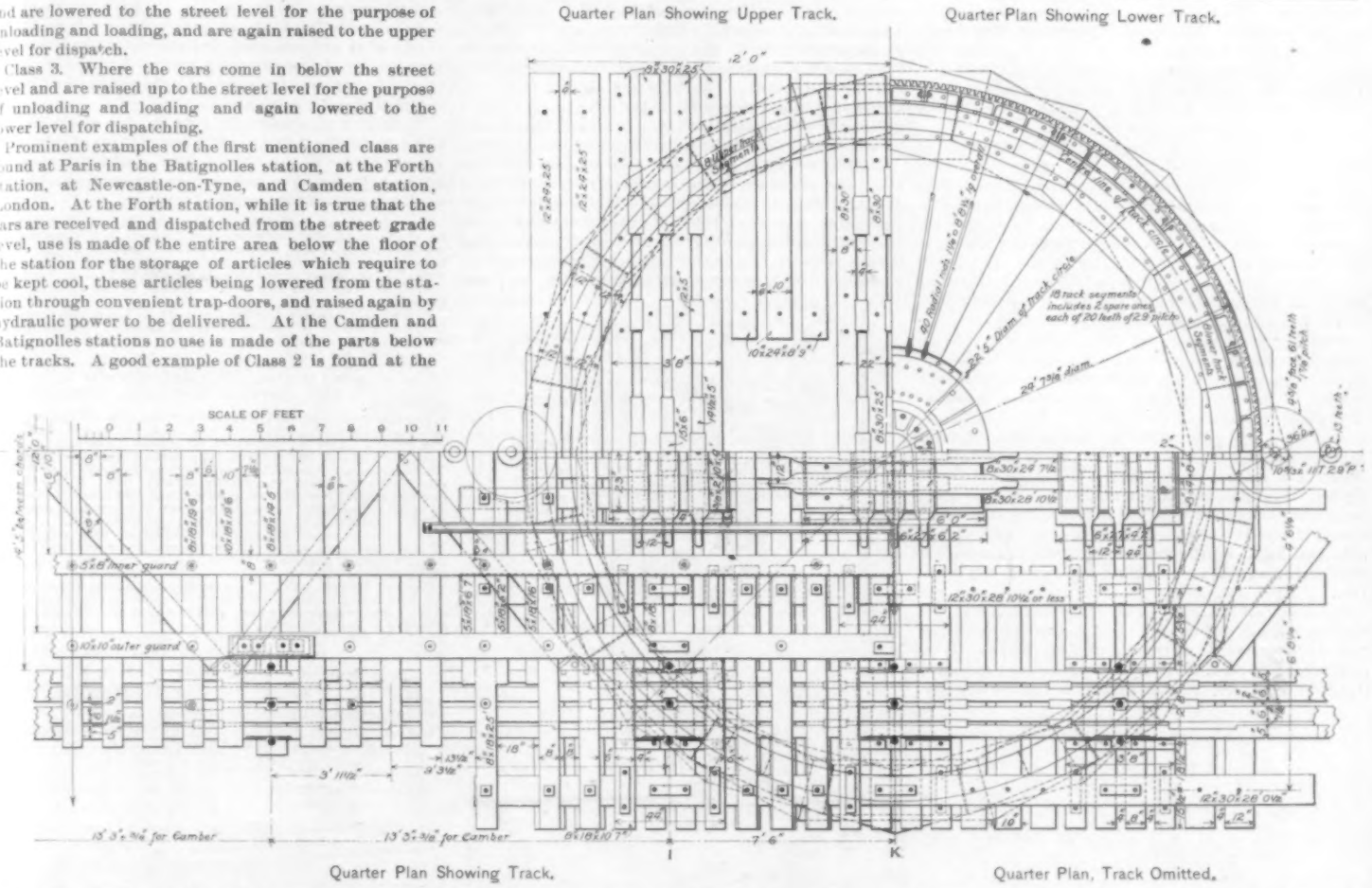
Class 1. Where the cars come into the stations on grade of the streets.

Class 2. Where the cars come in above the street level

and are lowered to the street level for the purpose of unloading and loading, and are again raised to the upper level for dispatch.

Class 3. Where the cars come in below the street level and are raised up to the street level for the purpose of unloading and loading and again lowered to the lower level for dispatching.

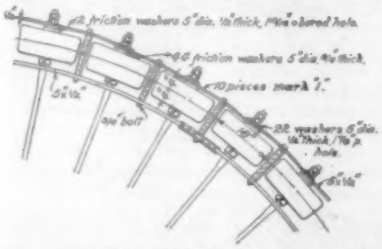
Prominent examples of the first mentioned class are found at Paris in the Batignolles station, at the Forth station, at Newcastle-on-Tyne, and Camden station, London. At the Forth station, while it is true that the cars are received and dispatched from the street grade level, use is made of the entire area below the floor of the station for the storage of articles which require to be kept cool, these articles being lowered from the station through convenient trap-doors, and raised again by hydraulic power to be delivered. At the Camden and Batignolles stations no use is made of the parts below the tracks. A good example of Class 2 is found at the



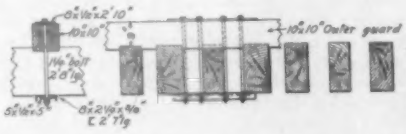
Quarter Plan Showing Track. Quarter Plan, Track Omitted.

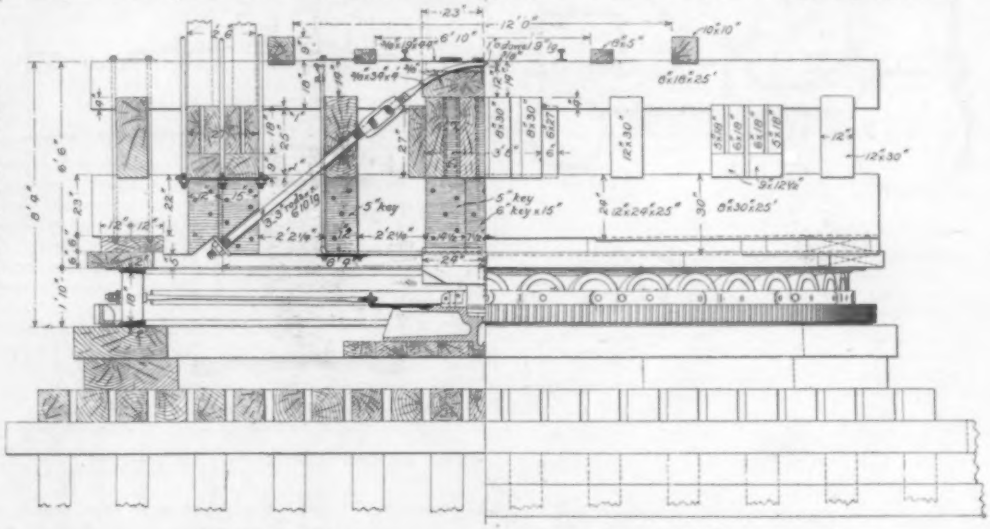
London & Northwestern Railway Company's Broad street station, at St. Pancras, London, and the St. Lazare station, Paris; and of the 3d class at White Cross station, Midland Railway, London.

In the methods employed for handling cars and freight in these three classes of stations above described there is a general sameness, that is, the transportation of freight, so far as the railroad proper is concerned, ends when the train is delivered in the yard. From this time onward until the train is again made up to be pulled out of the yard the entire handling of cars and train is done with hydraulic power.* The cars are hauled along the track, are turned around and sent across the yard to any other track, in fact, are moved in any and all directions, any car being taken out of any part of the train and put on any other track in the yard without the use of switching engines, and with very little disturbance of the general work going on over the whole yard. This is accomplished by a system of turn-tables, transfer-tables, capstans, cranes and car hoists, these latter only being used where it is necessary to move the cars from the upper to the lower levels, or *vice versa*.

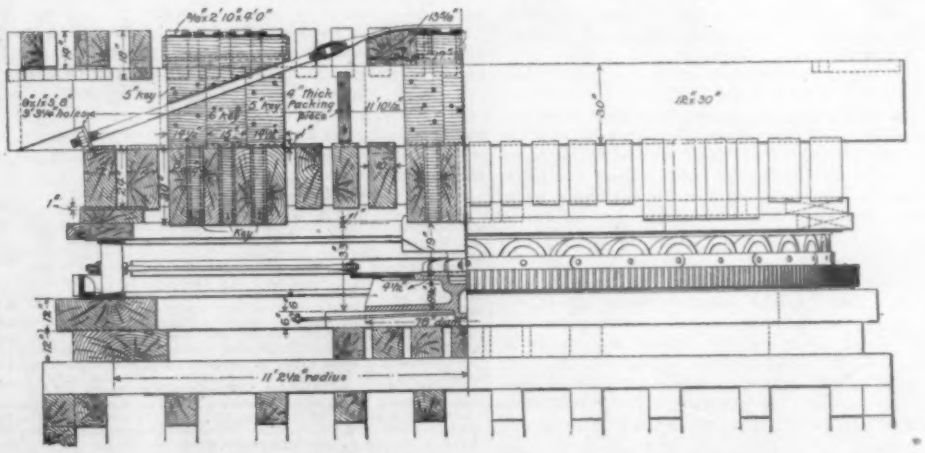


Detail of Rollers.





Half Section at K. Half End View.



Half Longitudinal Centre Section. Half Longitudinal Elevation.

TURN-TABLE FOR HOWE TRUSS DRAWBRIDGE, FRASER RIVER—CANADIAN PACIFIC RAILWAY.

Hydraulic Power.—The method of dealing with goods, either in receiving or delivering, loading or unloading, or in transit, as performed by hydraulic cranes, lifts, capstans, traverses and turn-tables, is as follows:

On receipt of a train in a goods-shed the cars are sorted for the various districts in which they are to be delivered by means of a traverse, which is a traveling section of the road running on wheels and hauled either by rams and chains under the flooring for short distances, or, when the distance to be traversed is longer, by capstans which are so placed as to readily command the station without being in the way. The traverse, with its car, is thus shifted from the main arrival line to any other portion of the shed or yard where it is required, or by turn-tables and capstans, where the traverse is not used. If it is required to descend to a lower level the car is hauled off by capstan power and placed on a hoist, by which means it is lowered to that level in the building in which it is required, and again hauled into position for unloading by cranes, which are usually of 1,500 to 2,500 pounds lifting power. Where turn-tables are employed, in the case of single turn-tables, that is, those with single tracks only over them, gearing is dispensed with, and the rope of an adjoining capstan is

*See *Railroad Gazette* April 21 and 28 and May 5, 1893, for a very complete description, with illustrations, of an English goods station and its hydraulic machinery.

hooked on to the car and the table pulled round to the position required. Where larger turntables with double roads, on which two cars may be taken on abreast, are employed, they are traversed round by a pinion wheel, engaging in a circular rack which goes around the outer rim of the table. It is put in or out of gear by a clutch movement, and hydraulic power is used.

The power for working this machinery is supplied by direct-acting pumping-engines. The pump and piston rods are coupled on the same axis central line, the suction pipe leading to the pump barrel is coupled on to the supply main, which again terminates in a receiving tank or receiver attached to the company's or city mains, as the case may be. This tank is placed above the level of the pumps, and the delivery pipe from them connected direct to the bottom of the stalk of the accumulator, which in its turn is again connected to the main delivery leading to the cranes, capstans, hoists, etc. The accumulator ram is weighted to a maximum of 750 lbs. per square inch, so that when it is pumped up (floating) the weight in the delivery mains represents that pressure. The whole operation of the hydraulic machinery, however placed, is in principle the movement obtained from rams, whether it be in capstans of quick action, or in hoists and cranes, in which the movement is much slower. The efficiency of the application of hydraulic machinery in capstan working, is materially affected by means of snatch heads, or anchor pulleys, placed in suitable positions. By the use of these snatch heads, one capstan is rendered capable of pulling a car in any direction.

The universal testimony of all of the engineers at the various stations and docks in England where hydraulic power is used, is that no trouble whatever has ever been experienced by them on account of frost, even with the temperature at zero, provided that in such severe weather during the night time, or when the machinery is not in operation, the water is allowed to slowly circulate around through the pumps. The engineer of the Midland Railway who has had charge of their machinery for many years, stated that by leaving one capstan running slowly on the entire system of many miles of pipes, no freezing had ever taken place.

At all of the railroad stations along the docks, unless the distance traversed by the hydraulic mains is very great, the water, when discharged from the various machines, is returned through suitable pipes back to the pump-room, where it is delivered into receiving tanks to be again pumped under the accumulators and again sent through the system, so that the amount of water actually consumed is only that which may be due to leakage, and this is not of sufficient amount to be taken into consideration.

The pressure pipes in all cases are made of cast iron, with joints bolted together; while all of the return pipes are ordinary cast iron water pipes with socket joints. The traverse tables are made of wrought iron or steel, strongly bracketed, the ends fitted with hinged deflecting points to make an easy ascent for the car. The capstans are of considerable range in power, varying from one to five tons direct pull upon a rope.

The car hoists as used at the Midland Railway I consider the best of their kind which I saw. These are fitted with three rams each of different size—the smaller of the three being always open to the pressure of the main and counter-balancing the weight of the table and the other two rams. The second is a little larger, and is sufficient as an auxiliary to lift the ordinary freight car with its load, or say, 15 tons; and the larger ram will, with the assistance of the other two, lift any weight up to 25 tons, and is so arranged that when not required it will fill its cylinder by suction, and thus give a firm and rigid wheel-base for wagons that may be passing over the platform.

Platform cranes are placed at convenient distances upon all of the platforms where freight is to be received or delivered, and are in power from 15 to 30 hundred weight capacity as a general rule. Many of these cranes are made with double rams for the purpose of economizing the use of water, the smaller ram being used in all cases where the loads are not more than 1,500 lbs., and where more than 1,500 lbs. is required to be lifted then the larger ram is placed in commission by the hand of the operator. One such crane used continuously during 10 hours will handle, in loading or unloading, 300 tons a day.

The Midland Railway Co. have in their London district 33 hydraulic engines and 1,400 hydraulic coal tips wagon hoists, capstans, cranes, sack lifts, traverses and turn-tables. The cost in the Midland system is 25 cents per thousand gallons delivered into the mains. In this cost is included five per cent. on the cost of the machinery and six per cent. on the cost of repairs, coal, oil, waste, wages, etc.

Machinery at Various Stations.

Broad Street Station, London & Northwestern.—Seven boilers, locomotive type, five pairs hydraulic pumping engines, one 17-in. accumulator, two 18-in. accumulators, one 20-in. accumulator, fifty-four 3-ton hydraulic cranes, three hydraulic jiggers, 3,000 lbs.; one 5-ton hydraulic crane, one 10-ton hydraulic crane, two 16-ton hydraulic car lifts, two 14-ton hydraulic car lifts, two hydraulic hoists, 3,000 lbs. each; 26 hydraulic capstans, 126 capstan dummies, one 5-ton yard crane.

Camden Station, London.—Four boilers, locomotive type; two pairs hydraulic pumping engines, one 17-in. accumulator, one 20-in. accumulator, 38 hydraulic cranes, 2,500 lbs. capacity; two hydraulic cranes, 4,000 lbs. capacity; one hydraulic crane, 6,000 lbs. capacity; two hydraulic cranes, 10,000 lbs. capacity; one hydraulic crane, 2,000 lbs.; 27 hydraulic capstans, 168 capstan dummies, 23 warehouse cranes 1,500 lbs. capacity; three warehouse cranes, 3,000 lbs. capacity; one yard crane, 1,500 lbs. capacity; one yard crane, 4,000 lbs. capacity; one yard crane, 10,000 lbs. capacity, one yard crane, 40,000 lbs. capacity.

Forth Station, Newcastle-on-Tyne.—Twenty-eight capstans, 50 cranes, 19 turn-tables, four traverse tables, three locomotive boilers, one in reserve; two hydraulic pumping engines, one 17-in. accumulator, one 18-in. accumulator.

Batignolles.—Two car hoists, 18 turn-tables, 12 cranes, four transfer-tables, two baggage hoists, four accumulators.

These figures give some idea of the work which is done by hydraulics in the way of placing cars in position to be loaded and unloaded, and also to load and unload them, in lieu of the switching engines for handling the cars, and in place of hand power for loading and unloading, as is done by us here.

Machinery at Docks.—To give an idea of the work along the docks, I name only a few of those of which I was at the trouble to make notes of the actual number of machines in use. The number here enumerated is but a small per cent. of those which I saw:

The Albert dock at Hull has a 60-H. P. engine, supplies water for working an 80-ft. swing-bridge, 19 hydraulic engines for working sluices, gates, capstans; three 20-ton coal hoists; one 15-ton crane; one 3-ton crane, and 34 1¼-ton cranes. Pressure used, 775 lbs., which is delivered through 5,350 ft. 3-in., 1,400 ft. 4-in. pipe, with 2-in. and 3-in. branches to the various machines.

At Cotton's wharf in London there are 10 hydraulic cranes, 2,500 lbs. capacity, lifting 40 ft.; four of 4,000 lbs. capacity, and one of 9,000 lbs. capacity, and one 48-ton direct lift; pressure used, 700 lbs. per sq. in.

At St. Catherine's docks, engines of 140 H. P. pump against 600 lbs. pressure. They pump through 1,200 yds. of 7-in. pipe. The power is used to work a swing-bridge, 75 cranes and 2 direct lifts.

The London docks, 185 H. P. pumping engines, 750 lbs. pressure, pump through 1,450 yds. of 5-in. pipe, 640 of 4-in. and 550 yds. of 3-in. These engines work 100 cranes, hoists and lifts.

At the Victoria docks, 280 H. P. pumping engines are used. These pump against 780 lbs. pressure through 700 yds. of 5-in. pipe, 2,000 yds. of 4-in. and 200 yds. of 3-in. pipe. The power exerted anually is more than 401 million foot tons, and here, as in the other docks, the power is used to operate a swing-bridge, capstans, and upward of 100 cranes and hoists.

The Great Western Railway at Paddington uses water at 700 lbs. to the square inch. They operate 3 car hoists, 3 capstans, 3 hauling engines, 20 turntables, 54 cranes of 2,500 lbs. capacity, 16 hoists, 3 traverse-tables, 2 drawbridges.

Cost of Power.—Taking coal at $2 per ton, and allowing 15 per cent. for interest on the cost of the plant and depreciation of the same, wages, oil, waste, etc., the cost per 100 foot tons of power is about 2½ cents.

Hydraulic Power in Terminals for Cities.—The railroads and docks of England have had in very general use for the last 25 years the system which I have briefly described, and the machinery of the London & Northwestern Broad Street station has been in use for 30 years and is still in perfect condition, doing its regular work every day just as well as when first put in. The various hydraulic appliances in use at stations and docks show great ingenuity in their construction and adaptability to the work required of them, and many of them show in their construction the highest engineering skill.

A system of operating cranes, hoists, engines of all descriptions on a much greater scale than is done by any of the docks or railroad companies in any one plant, is found in the London Hydraulic Power Co., of London, who are delivering water under 750 lbs. pressure through 64 miles of street mains, and supplying power to more than 2,000 machines. The Liverpool Hydraulic Power Co. and many others are also furnishing power from central stations to hundreds of consumers. This system is also being laid down in Glasgow and Manchester by the city authorities for general distribution of power to who ever may require it. I mention these facts, not that they have any relation practically to what is required in the railroad terminals of Chicago, but simply to show that the system has long since passed far beyond the experimental stage. It is fully developed and proved to be the most reliable, economical and convenient power so far known.

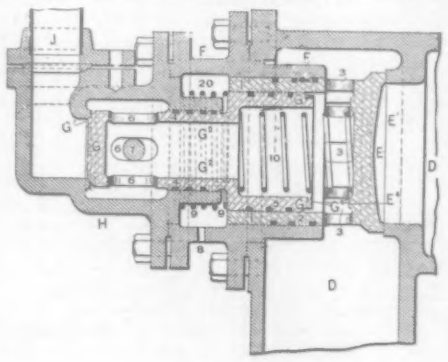


Fig. 6.

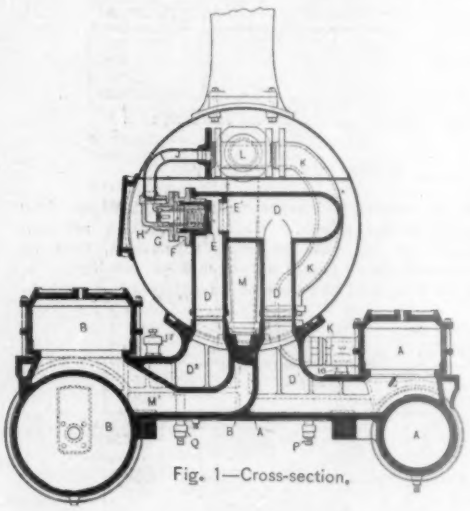


Fig. 1—Cross-section.

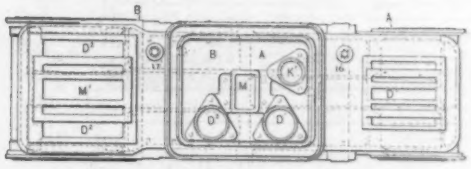


Fig. 2—Plan.

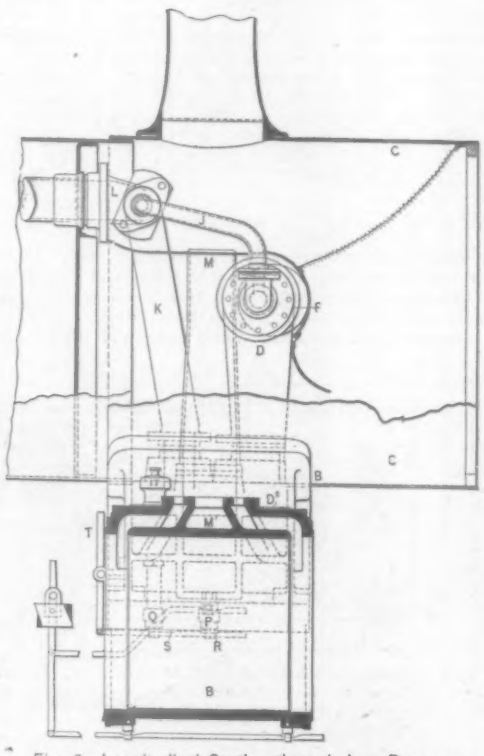


Fig. 3—Longitudinal Section through Low-Pressure Cylinder.

THE BROOKS COMPOUND LOCOMOTIVE.

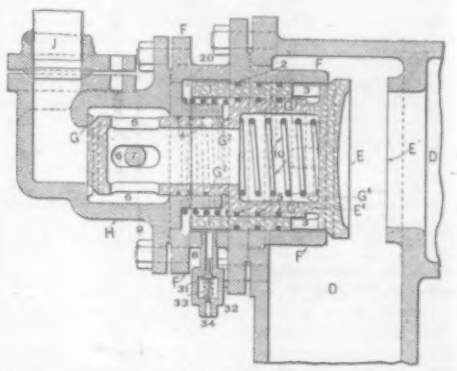


Fig. 4.

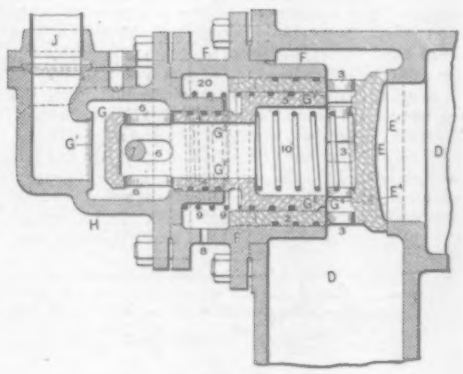


Fig. 5.

There is no difficulty whatever in constructing the pumps to deliver the water under the pressure required, nor is there difficulty in manufacturing the pipes and machinery, nor in maintenance. I saw in Liverpool pipes being removed from the ground which had been in constant use, with 750 lbs. pressure upon them, for 35 years, and they were, to all appearance, just as good as new. They were being taken up to make room for elevated railway foundations.

I give some figures as to what is daily performed at the White Cross station of the Midland Railway in London, which is a very good example of what can be done upon a small piece of ground.

The ground occupied is irregular in shape and altogether only about one acre in extent. The basement is excavated to the level of the Metropolitan Underground Railway, and in this basement all cars are received. They are then lifted up to the street level, about 25 ft. above, and are there loaded and unloaded, and then lowered again, train made up and forwarded to destination. Above the street level there are two stories connected with those below by elevators; these storage rooms are for such freight as is not called for, or which the company is not at the time prepared to deliver. This station has its own power house, with its hydraulic service pipes, capstan, cranes and two car lifts, four elevators for the upper stories, two accumulators, two locomotive boilers, two pumping engines. These are also located upon the one acre of ground. The water pressure used is 750 lbs. to the square inch.

I saw 19 cars transferred from the lower level to the higher one on one of the lifts in 20 minutes, while the other was delivering cars in the reverse direction at the same rate. Between the hours of 6 p. m. and 11 p. m., 160 cars in and 160 cars out are handled; that is, 160 cars which come in loaded are taken up 25 ft., unloaded, loaded up again, and brought down and put into a departing train and sent away, or, in short, one car per minute is received, sent up to the street level, unloaded, loaded up, sent down again, and sent away. One can be excused if he has doubts of the truthfulness of this statement, but it is true, nevertheless.

I may state, in brief, that hydraulic power is so universally used throughout England—along her docks for loading and unloading the ships, for pulling them into position, for turning bridges, opening dock gates, etc., and for all railroad terminals, and over large areas of many of her cities—that hydraulic power may be considered "on tap;" and I find myself asking why it is that in England they use the hydraulic system so generally for doing the work which I have described, and we use it not at all? With cheap labor, as in their case, the necessity for motive power of any kind for doing work which can be done by the hand of man is less than with us, where labor is so high. And the only answer I can make which satisfies me in this respect is, that this English system of terminals has generally been investigated by men from America who were not skilled in hydraulic appliances; and as our cars are larger and heavier than those used in England, it has seemed to those men that we could not apply the same machinery to our system which has been so successfully used in England and elsewhere. Another reason why we have not adopted the system may lie largely in the fact that the railroads in England, where their terminals exist, were built when the cities through which they ran were already in existence, and the necessity of economy in use of ground, and in rapid and cheap means for handling trains and goods, was forced upon the attention of railroad builders at the outset; while with us we built our railroads in a greater degree without any cities, or, if any, small ones, and there was no necessity for economizing in space. Now that our cities are built, the same questions are forced upon us in regard to terminals in our cities which were forced upon English engineers at the beginning. To my mind, however, there is no good reason why we cannot handle our larger cars just as well as the smaller ones. In practice we find no difference in a hydraulic lift, whether we raise a barrow of ashes from the basement of a building to the sidewalk, or whether, as in the Mersey Railway of England, they lift a car 87 ft. at a speed of 200 ft. per minute, these cars being 19 ft. 6 in. × 16 ft. 6 in., and 10 ft. high, and loaded with 15,000 lbs. of passengers; it is simply a question of size of the hydraulic machinery. The 100-ton guns built by Armstrong are handled by hydraulic power as readily as if they weighed but a pound. The truth is, the weights to be handled by hydraulic pressure need not be taken into consideration; it is only that the engineer in making his calculations shall know what are the weights to be handled.

In constructing the terminals of England great wisdom has been shown in utilizing the small terminal space covered by them, but with our knowledge of elevator work, which is not equaled by anything which the English people possess, we may safely go still further than they have gone: they have but pointed the safe way.

In constructing the terminals here, in addition to all I have seen in England, I would advise that the stations be built several stories in height, and made great terminal warehouses. I would lift by hydraulic power the loaded car directly up to any floor of this warehouse, haul it off from the elevator platform, unload it and send it down again. If these goods are again to be shipped by rail, the empty car should be sent up to the floor where the goods are stored, and there loaded and sent down. The cost of taking this car up and down again, so far as coal is concerned, is just the friction of the moving parts of the machinery, because all of the power which was required from the pumps to raise the loaded car to the top floor of this warehouse, will be given back by descent of the car when again sent down loaded. It is also true that the weight of goods descending from the various floors of this warehouse will give back all the power which was required to raise them up there, less the friction of the parts. The cost of power, however, per ton of freight moved in the yard in transfer of cars from one position to another, and the loading and unloading of the trains, is an amount so small per ton as hardly to be considered in calculating the terminal expenses. With these double-level stations, you, of course, have double the area for tracks, and with the aid of hydraulic machinery for handling the cars and freight, you will have again doubled several times the capacity of the terminal for handling cars. There is not a shadow of doubt in my own mind as to the wisdom of a very liberal expenditure of money to produce in the city of Chicago, and in fact, in all of our pricipal cities, this form of terminal and method of operation.

The Brooks Two-Cylinder Compound Locomotive.

It is generally known that there has been in operation on the Lake Shore & Michigan Southern Railroad for several months a two-cylinder compound locomotive built by the Brooks Locomotive Works under patents issued to Mr. John Player, Mechanical Engineer of the Brooks Locomotive Works. The notable features of Mr. Player's patents are shown in the accompanying illustrations.

Referring to fig. 1, it will be seen that a novel form of receiver has been adopted and that the combined intercepting and reducing valve is placed in the smoke box on the right hand side of the engine. The course of the steam is so clearly indicated in fig. 1 that further description of the general arrangement of the engine is unnecessary. The intercepting and reducing valve is shown in greater detail and in two positions in figs. 5 and 6. The position shown in fig. 5 is that which the valve occupies when the engine is working as a compound. Suppose that the throttle is opened when the valve is in this position, live steam enters by the pipe *J*, and pressing on the end of the reducing valve *G*, opens it and passes thence through the openings (6) and the cored space in the reducing valve and acts upon the back of the intercepting valve *E*, closing it against its seat *F*. The valve would then occupy the position shown in fig. 6. When in this position steam flows through the openings (3), into the low pressure end of the receiver, and thence to the low-pressure steam chest and cylinder. The pressure of the steam thus admitted to the low-pressure steam chest is regulated by the relative areas of the two ends of the reducing valve. Under these circumstances steam from the high-pressure cylinder is exhausted into the closed receiver until the back pressure in the receiver is approximately equal to that of the steam being admitted directly to the low-pressure side. When the pressure on the high pressure side reaches this point approximately, the intercepting valve *E* is forced open, and by its first movement closes the outlet of the reducing valve at G_4, thus closing off the direct supply of steam to the low pressure side. The difference in area between the large end of the intercepting valve and the small end of the reducing valve is then sufficient to enable the receiver pressure to remove both valves further to the left, as shown in the illustrations, and to close the reducing valve, thus shutting off the direct supply of boiler steam to the low-pressure cylinder. It will be seen that this valve is, as has been mentioned, a combined reducing and in erceptiog valve, and has some points of superiority over valves of this sort which have been heretofore brought out. Mr. Player has patented several other forms of this valve, one of them provided with springs for regulating the action in opening and closing, and also providing for placing the valve in the cylinder saddle.

Another feature of this system of compound locomotives is the arrangement of regulating valves which is shown by fig. 4 and at *P* and *Q* in fig. 1. The object of these valves, which it will be seen are operated similarly to the ordinary cylinder cocks, is in the first place to provide an outlet for the exhaust steam from the high-pressure cylinder when it is desired to move the engine a short distance, as in switching, etc., from secondly to provide a means of freeing the receiver and steam and so taking all pressure off of the low-pressure piston when it is desired to stop the engine within a short distance, as in coupling to trains, etc.

The locomotive to which this system has been applied on the Lake Shore & Michigan Southern Railroad is a 10-wheel engine intended for burning soft coal. The boiler is of the wagon-top type and is intended for a working pressure of 180 lbs. The plates used are $\frac{7}{16}$, $\frac{1}{2}$ and $\frac{9}{16}$ in. thick, the horizontal seams are quadruple riveted lap joints, and the circumferential seams are double riveted. The crown is supported by crown bars. The feed water is supplied by two No. 8 monitor injectors. The following are the principal dimensions of this engine:

Total weight of locomotive in working order	172 000 lbs.
Total weight on drivers	75 000 "
Wheel base	23 ft. 3 in.
Driving wheel base	13 ft. 3 "
Rigid driving wheel base	8 ft.
Diameter of cylinders	17 and 28½ "
Stroke of pistons	24 "
Steam ports, high-pressure cylinder	16 × 1⅝ "
Exhaust ports, high-pressure cylinder	16 × 3 "
Steam ports, low-pressure cylinder	20 × 2¼ "
Exhaust ports, low-pressure cylinder	20 × 5 "
Maximum travel of valve, high-pressure cylinder	5¾ "
Maximum travel of valve, low-pressure cylinder	7 "
Lap of valve, high-pressure cylinder	⅞ "
Lap of valve, low-pressure cylinder	1¼ "
Inside clearance of high-pressure valves	1/16 "
Inside clearance of low-pressure valves	¼ "
Lead of high-pressure valve in full gear	1/32 "
Lead of low-pressure valve in full gear	3/16 "
Diameter of driving wheels	56 "
Driving axles	7 × 8 "
Diameter of truck wheels	28 "
Truck axles	4¾ × 10 "
Main crank pins	4½ × 6 "
Intermediate coupling-rod pins	5¼ × 4¼ "
Front and back coupling-rod pins	3½ × 3½ "
Diameter of boiler, outside first ring	62 "
Size of firebox	96 × 34 "
Water space, 4 ins. front, 3 ins. side and back.	
Tubes, 186, 2 ins. diameter, length over sheets	12 ft.
Size of crown bars, welded at ends	5 × ⅝ in.
Exhaust nozzle, single, diameter	4½ "
Smokestack, diameter inside	13 1/16"
Ratio of high to low-pressure cylinder, 1 to 2.81	
Ratio of high-pressure cylinder to receiver, 1 to 4.5.	
Smallest diameter receiver passage	7 "
Diameter of intercepting valve	7 "
Smallest diameter of reducing valve	3 "
Inside diameter of live steam supply pipe to reducing valve	2¾ "

The Use of Air Brakes on Freight Trains.

At the regular meeting of the Buffalo Superintendents' Association, Nov. 17, Mr. T. A. Roberts, Division Superintendent on the Philadelphia & Erie, presented a paper on the above subject, the substance of which we give below.

The use of air brakes on freight trains, as now practiced, is a proper subject for this association, as it presents many phases that need attention. It has been our custom to place all air brake cars on the front end next the engine and couple up the air for use. The occurrence of an unusual number of accidents to trains thus made up, during last winter and spring, led to investigation, and the conclusion that it was due to the use of a small number of air brake cars coupled ahead of long trains and used in connection with the hand brake on the balance of the train. The physical characteristics of our line are as follows:

Starting at Kane Summit, the west end of the division (which is 101 miles in length), the first 10 miles eastward descends at an average of 78.5 ft. per mile, maximum 105 ft. and minimum 52 ft; from this point, continuing eastward for 16 miles, the average (descending) grade is 29.3 ft. per mile, maximum 30 and minimum 27 ft.; continuing eastward we have an ascending grade for 10 miles to what is known as St. Mary's Summit at an average of 42 ft. per mile, maximum 53 and minimum 31 ft.; descending from St. Mary's Summit for 20 miles the profile shows an average of 41.5 ft., with a maximum of 53 and a minimum of 29; from this point to the east end of the division, at Renovo, a distance of 45 miles, the average descending grade is 16.8 ft. per mile, maximum 21 and minimum 14. The maximum number of cars in an eastbound train starting from Kane Summit is 60 loaded to the second summit at St. Mary's, a distance of 34 miles; from this last named point east for 67 miles, to the end of the division, the number of cars hauled in each train varies from 60 to 100, loaded, our average train being about 80 cars.

My investigations developed that the cause of the accidents was principally irregularity and want of uniformity in the crews handling the trains as shown at certain known points on the line where the application of the brakes for controlling trains is a daily practice. This fact was further confirmed in examining the crews upon trains which had had accidents of this character. From their testimony it was shown that the results were brought about by the sudden application of the air brake, say on from 10 to 20 air brake cars next to the engine, before the men working the hand brake on the middle and rear portions of the train could supply a sufficient number of brakes to control it in a uniform and regular manner. In releasing the brakes the engineman would suddenly release the air brakes from the front end while those in the rear were still on, such action tending to pull the train apart. The whole effect of such handling was to produce a heavy strain upon the entire train. If, on the other hand, the entire train could be controlled either by a sufficient number of air brake cars to hold it, or by the application of hand brakes in a uniform way, better results could be obtained, and the evil complained of avoided.

Among other things I found in handling trains by hand and air at the same time that the train crews depended too much upon the engineman for controlling the train, and they were becoming careless and indifferent. In every instance where the opinion of the men was asked they had no hesitation in saying that a train could be better handled by hand brakes alone than by a combination of the two; unless, of course, there were a sufficient number of air brake cars on the train to completely control it by their use. Another important feature enters into the case, and that is that where a train is handled in this manner the presence of a large number of cars equipped with automatic couplers in connection with the old style link and pin couplers is very destructive; it is, however, impossible to avoid this.

To practically test my conclusions, I gave directions for discontinuing the use of the air brake on freight trains, unless there should be a sufficient number of cars equipped in that way to control the entire train, and to return to the use of hand brakes only; and the result has been that we have not had an accident from trains parting since April 17 last, while in March and April alone, during which time the practice of using the air and hand brakes was in vogue, we had four such cases, attended by much loss and damage. My conclusion, therefore, is that the use of the air brake in this way should not be continued. There is no question as to the efficiency of the air brake, where there are a sufficient number of cars equipped in that way to control the movement of the entire train. . . . . I am aware that arguments will be presented to controvert my position. It will be said that much of the evil might be corrected by proper instruction of enginemen in the handling of the air-brake. Much time

was spent and care taken when the air-brake was first introduced to passenger service, and it is fair to presume that much more time and care will be required to educate freight enginemen to attain the same results.

A considerable discussion ensued, most of the members present participating in it. Several members had had accidents from the sudden stoppage of freight trains by too quick application of the air. There was a general sentiment that lack of care on the part of enginemen was responsible for most of the troubles incident to the use of air brakes, but there was no agreement as to the most effective way of training runners so that they would do better. Mr. Brunn of the Erie held that break-in-twos of freight trains were generally due to a lack of understanding between enginemen and trainmen. Mr. Meade, of the Northern Central, brought out the point that an engineer, when near the foot of a descending grade should see that the hand brakes are let off before he releases the air brakes. Mr. Brunn stated that on the Erie the hand brakes were applied at the rear of the train in making all ordinary stops, and also in going down grades, although the air brake was used on such cars as could be placed at the front of the train and made available. Mr. Jordan of the Michigan Central, stated that he had issued instructions to engineers, never to release the air without first giving the whistle signal for the release of the hand brakes.

An Improved Air-Tight Car Door.

The Carson & Gurganus improved car door for fruit and refrigerator cars which has recently been brought out has several interesting and valuable features. Our illustrations show this door as applied to a Mobile & Ohio refrigerator car, both for the side doors, while the detailed drawings show clearly the construction of an end door which is similar in principle to the side door. Referring to the sectional plan it will be seen that the central portion of the door is attached to the outer frame by means of a vertical rod, and can be moved in and out within this frame by means of two eccentrics. The door is shown closed in the drawing, and it will be seen that there are two compression joints. By reversing the position of the handle the central portion of the door is moved out sufficiently to allow it to clear the side or end of the car, and at the same time a space is provided for ventilation. In the case of the end doors a wire netting is set inside the frame, the construction of the netting and the arrangement of the protecting rods being shown in the illustrations. In the case of the side doors the open door is brought into use by sliding the solid door along.

Some of the principal advantages which are claimed for this car door are as follows: It can never jam or get fast on account of expansion or contraction of material; it is easily operated and is not liable to get out of order, and can be readily applied at small cost; it is absolutely air and water tight; it is safe, and it will not fly open while the car is in motion and endanger bridges and other objects near the track; as it is a compound door the car may be hermetically sealed or partially ventilated without exposing the contents of the car, or the door may be shifted clear of the door opening so as to allow the use of a screen door; it will save empty mileage as the car may be ventilated the same as any other fruit car, or it may be hermetically sealed and used as a refrigerator car; it may be applied to any first-class box or refrigerator car; it has double insulation, which is so well protected that it is not likely to be damaged by freight handlers; it is not affected by the camber of the car nor by sagging of the sills; it reduces the amount of special service equipment, as cars fitted with this door can be used for a great variety of shipments for which cars of special design would otherwise be required; and as it does not swing on hinges nor project much outside of the contour of the car, it can be readily opened at high platforms and other positions in which doors swinging outward could not be used.

Carson & Gurganus Improved Air-Tight Car Door.

Water Works.

J. J. R. Croes, M. Am. Soc. C. E., has been engaged in investigating the condition and requirements of the Middlesborough (Ky.), water-works, and has been requested to prepare estimates of the cost of an extended sewerage system for Geneva, N. Y.

Convention of the Roadmasters' Association of America.

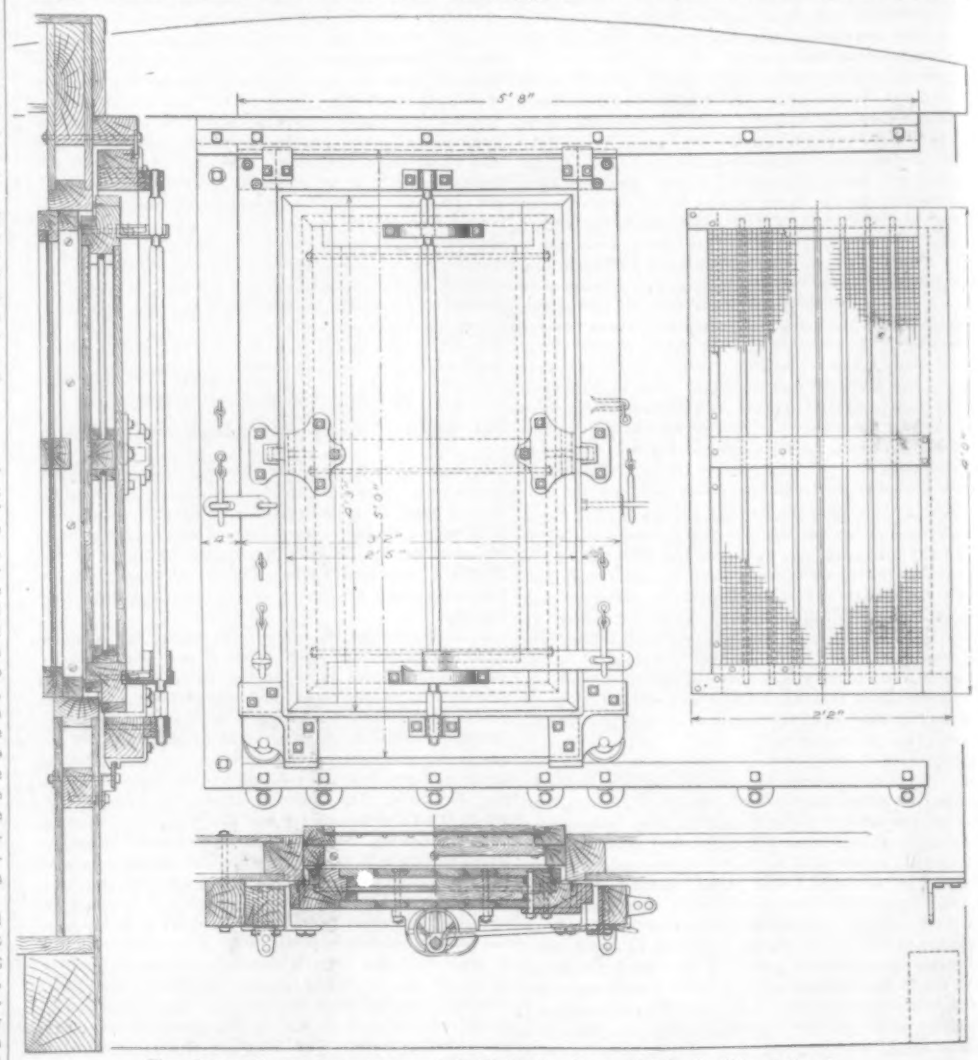
We gave last week, in the department of "Meetings and Announcements," page 869, an outline of the first day's meeting of the Roadmasters' Association at Chattanooga. The second session was called to order at Atlanta at 9:30 Wednesday morning, Nov. 16. There was more or less introductory speech-making by various members, as also by Mr. Reed, who represented the Mayor of the city. A letter was read from the Governor regretting his inability to be present. President Doyle replied to these civilities.

The first regular business was the report of the Committee on Steel Rails. The committee declined to submit a table of chemical requirements for rail steel, but laid down the principle that the head should be broad and shallow, with nearly vertical sides, the corner radius ⅛ to ⅜ of an inch, and the total metal in the cross section be distributed about as follows: Head, 43 per cent.; web, 22 per cent.; flange, 35 per cent. For standard gauge the weight should not be less than 70 lbs. The committee consisted of Messrs. R. Caffrey and D. H. Lovell.

This report was followed by the report of the Committee on Rail Joints, submitted by W. H. Stearns, Chairman. An abstract follows:

RAIL JOINTS.

At our eighth annual convention, held in Detroit, Mich., Sept. 9, 10 and 11, a trial test of the following joints was recommended: The Weber rail joint, Col. Long's truss joint, McConway & Torley's reinforcement for present angle bars, Fisher's new improved joint, Cloud joint. At the following convention, held in Minneapolis, the Thompson continuous rail joint and the Heath joint were added, and at a meeting of the executive committee held subsequently the mitre cut rail joint was suggested. Your committee have with considerable



The Carson & Gurganus Improved Air-Tight Car Door—Mobile & Ohio Railroad.

pains and care investigated the results obtained from a trial of these joints and find them in nearly every instance quite satisfactory.

In studying the joint question we have concluded that the most promising way in which to improve our present joints is to introduce an extra support from below, which will supply as much extra resistance to deflection under the joints as any other part of the rail affords. And we will briefly state what we consider as important requirements of a perfect joint contrivance.

1. Sufficient strength to safely resist the vertical stress.

2. It must hold the ends of the rails so that one rail end cannot deflect in the least without an equal depression of the other.

3. It must hold the rails so firmly that with sound ties and a suitable ballast creeping is prevented as far as possible.

4. When the joint is securely tightened in all parts it must permit the expansion and contraction of rails.

5. It must materially aid the spiking in holding rails to line and gauge.

6 That it shall not require a form of rail peculiar to itself, and that it shall consist of as few parts as consistent with the foregoing requirements.

If we consider a rail as a series of short continuous girders well supported on ties 21 to 24 inches on centres, the space or girder in which the joint occurs will inevitably deflect much more under a given load than at a point on a solid rail midway between supports. From this it follows that we must apply sufficient support under the joint to overcome this weakness. With our ordinary angle bar such support is given under the head of the rail at a point where it is possible to get but small bearing surface, and that too on an objectionable angle. But it is not sufficient to simply support rail ends; they must be almost as strongly held down.

On the 16th day of July last we wrote the manufacturers of the several joints for a list of roads on which their joints had been applied. From one we have received no reply.

We give a brief description of the various joints.*

Weber Joint.—A feature of this joint which is considered its chief advantage is its enormous strength, sustaining a load of some 80,000 lbs. on a joint before permanent set is effected. We understand that this joint has been used on the New York, New Haven & Hartford with good results.

Long's Truss Rail Joint.—This joint has been used on the C. & N. W., C., B. & Q., F. & P. M., C., St. P., M. & O., and other railways with a very great degree of satisfaction. Mr. E. P. Edwards, of the C. & N. W. Ry. says: "I can safely say that we could save one man's time on each section if we had the truss rail joint in general use, but this expense is a small item as compared with the batchering of ends of rails as we have them with other joints." Mr. Wright, of the same road, says: "I am surprised myself to see the amount of labor saved." Mr. Brown, also of the C. & N. W., says. "They have given

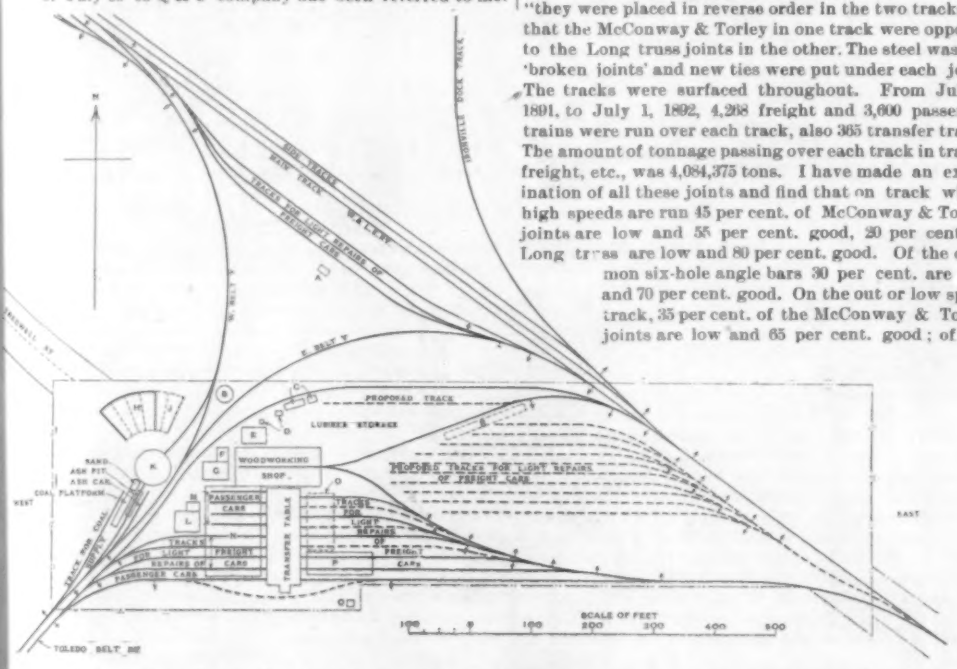
* Descriptions of well-known joints are omitted.—EDITOR.

entire satisfaction in every particular; are now just as perfect as the day they were put on." Mr. Hallit, of the C., St. P., M. & O. says: "They are the only perfect rail joint I have ever used. I consider the joint the strongest part of the rail."

M'Conway & Torley's Reinforcement.—This joint has been used for a considerable length of time on the Chicago, Milwaukee & St. Paul, Manhattan Elevated, Allegnany Valley, Flint & Pere Marquette, Chicago & Northwestern, and others, with marked satisfaction. Mr. Robert Black, of the Manhattan Elevated road, says: "I have a mile of these joints which have been in use a year; and they have given entire satisfaction."

Fisher's New Improved Joint.—The improvement consists in replacing the clamps with short angle bars reaching up into the neck of the rail and allowing one bolt to pass through each rail end. This device remedied the failure of the joint in keeping the heads of the rails in true line. Two hundred of these joints were applied on the Philadelphia & Reading railroad near Langhorne station, Pa., about one-third of them being on a curve. These have been some seventeen months in service, subject to the heaviest traffic and high speed of that road between Philadelphia and New York. Mr. M. F. Bonzano, superintendent of that road, examined these joints on Aug. 19, 1892, and says: "I had some joints taken off, and found them in as good condition as when first put in use, and all rail ends are in good surface and condition."

Cloud Joint.—In reply to our letter of inquiry in regard to the Cloud joint we received the following from Mr. Jonathan W. Cloud, which explains itself: "Yours of July 16 to Q & C company has been referred to me.



A, car repairers shanty; *B*, water tank; *C*, coal bins; *D*, boiler stack and oilhouses; *E*, pump heater, engine and boiler; *F*, iron mach. shop; *G*, blacksmith shop; *H*, engine house built; *J*, proposed foundry; *K*, turntable; *L*, supply room; *M*, Office; *N*, car erecting shop; *O*, proposed open shed for freight car repairs; *P*, paint shop (first floor), tin shop and upholstery (second floor); *Q*, paint supplies; *R*, proposed lumber shed, 12 ft. × 140 ft.

Car Shops of the Wheeling & Lake Erie Railway at Toledo, Ohio.

Dunham was handling, or getting ready to handle, my rail joint, but he died and left it in such shape that I have not yet been able to get it in readiness for business. The delay has been with the ownership, and not with the device."

Thompson's Continuous Joint.—The Thompson continuous rail joint consists of ordinary angle bars with the outer angles turned and passing nearly half way under the base of the rail, leaving a narrow space there to allow for tightening the bars. It has been used with success on the West Snore, New York Central & Hudson River, Boston & Albany, Boston & Maine, Chicago & Northwestern, Cincinnati, Hamilton & Dayton, and other roads. Mr. William Manley, of the C. & N. W., says: "In reference to the Thompson continuous rail joint would say they were put on 60-lb. steel in the month of May, 1891. The steel was laid in July, 1889, and is in good condition. During the season of 1891 the weather was very dry and we were unable to get a satisfactory trial of this joint. During the months of May and June, this year, we had considerable wet weather that softened our roadbed, and during that time we found that the continuous joint does not hold up any better than the common angle bar."

Heath Joint.—The Heath joint, as first presented to us, and later devices shown, are at such variance that we are hordly able to decide upon its composition or make up. One-half mile of these joints have been applied on the C., St. P. & K. C., and enough for 1¼ miles shipped to the A., T. & S. F., but thus far none have been in use enough to give us a fair trial.

The Mitre Cut Rail.—Quoting from a letter of Mr. R. Caffery, Supervisor Eastern Division of the Philadelphia & Reading Railway, he says: "We have in use on our road a large number of rails with ends mitre cut instead of square. They are fastened with our standard six-hole angle bars. We have had them in use exclusively for about three years, and they are proving very satisfactory. The perceptible blow of passing wheels over them is entirely removed, and there are no low joints where they are in use."

The committee offer the following resolutions:

We recommend that the Weber joint, the Cloud joint and Thompson's continuous rail joints are practically angle bar joints, and should be considered as such and dropped from our further consideration of new appliances, but considered as improved appliances.

We recommend that the Truss rail joint, the Fisher new improved joint and McConway & Torley's reinforcement have proven very successful on trial, and that the association recommend them for further trial.

We consider that the mitre cut refers more particularly to the rail than to the joint appliance, and should be so considered.

We recommend that the Heath joint be subjected to common 40-in. angle bars, 35 per cent. are low and 65 per cent. are good. I do not consider this a satisfactory test of these joints, as the track has not been entirely picked up since it was surfaced. Next year at this time we should be able to get data by which we can easily determine the durability and staying up qualities of these different joints, as the track will all have been picked up by section men and tamped with bars."

Mr. J. H. Conlen of the Chicago, Rock Island & Pacific, wrote that "nothing but constant attention has preserved the rail ends with the Long truss joint from batter. Joint ties do not last as long as they do under our standard 24-in. angle bar joint. There is also a tendency on the part of the ties to buckle, throwing all the load on the extreme ends of the base plate, so that in many cases there is half an inch clearance under the plate at facing side of joint ties."

(*Concluded on page 887.*)

Car Shops of the Wheeling & Lake Erie Railway.

The car shops of the Wheeling & Lake Erie Railway Co. are situated at the junction of that railroad with the Toledo Belt Line. The general arrangement of these shops and the distribution of the different departments is shown by our engraving and the references which accompany it. Ground was broken for these shops Sept. 10, 1891, and they were erected and in operation within four months from that date, this rapid construction being necessary in order to fulfill a condition of a contract with the city of Toledo. The arrangement of buildings and tracks was designed to suit the main tracks of the two adjacent railroads and the shape of the tract of ground already owned by the Wheeling & Lake Erie Co. The eastern part of the ground was unavailable for anything but a repair yard, such as is shown in our illustration, on account of having been excavated below the grade of the road a number of years before and about 40,000 cu. yds. of earth having been removed. A water service and drainage plant had to be constructed on account of the location being outside the limits of the city service. The arrangement of buildings as shown was adopted with the desire to make it possible to reach all parts of the buildings and grounds with a truck car, and also to switch cars from track to track without a locomotive by use of the transfer table. This transfer table is operated by steam power and is provided with a haulage drum. The buildings are principally of brick, and are heated by the Sturtevant system. They are intended to afford facilities for maintaining the car equipment of the road, which consists of 28 passenger and baggage cars, 42 cabooses and tool cars and 5,042 freight cars. The cost of the shops, including machinery, was about $65,000.

A New Conduit System for Electric Railroads.

A patent has been issued to Mr. R. W. Barkley, of Brooklyn, N. Y., for a conduit system for electric railroads which possesses some novel features. The principle of this system is that the conduit is to be divided into box sections which are air-tight at the top, sides and ends and open at the bottom. A cross section of one form of the conduit showing the shape of this box, or

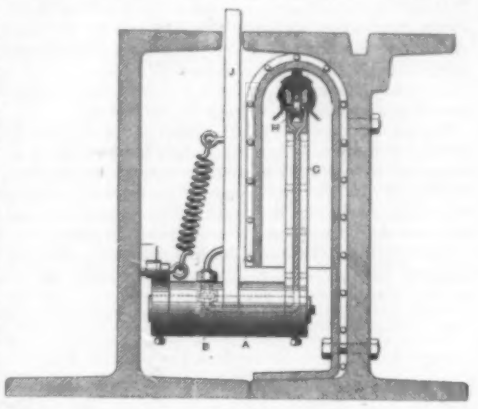


Fig. 1.

A New Conduit System for Electric Railroads.

diving bell as the patentee calls it, is shown by fig. 1 in our illustration. The adjacent sections or diving bells are connected as shown in fig. 2, the conductor passing through thimbles which form stuffing boxes, and being surrounded with insulating material in the space *C* which is provided for making joints in the conductor. The object of this diving bell arrangement is, of course, to absolutely prevent moisture from reaching the conductor *E*. The connection to the car is made by means of an underground trolley arranged somewhat like that used on cable roads. To

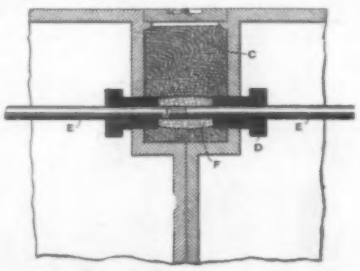


Fig. 2.

pass the trolley from one box to the next the lower part of the carrier is made so that the trolley can be turned down, and this deflection is accomplished by means of the guide piece and roller shown at the left in fig. 1. These guide pieces are put in at the ends of each box, and when the rollers strike the end of the guide the trolley is turned down far enough to clear the flanges by which the boxes are connected. It is intended that each car shall carry two carriers and trolleys, which are to be spaced at such distances apart that both cannot be thrown out of contact with the conductor at the same time. It is also provided that when one of the carriers on a car is depressed into the conduit electrical connection between it and the motor is broken, avoiding a possible short circuit at this time.

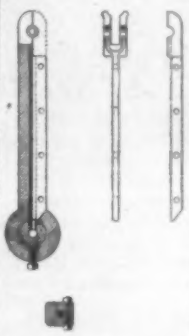


Fig. 3.

Harveyized Steel in Europe.

The first Harvey steel armor plate made and tested in Europe has proved an unqualified success, the plate pulverizing the projectiles without sustaining a single crack, a quite unprecedented circumstance in trials of armor plates. The plate in question was made by Vickers & Co., of Sheffield, England, and was tested by the British Admiralty, and a similar plate of high-carbon, nickel steel, treated by the Harvey process has been tested in Russia recently, but particulars have not been published yet.

Improvements in the Westinghouse Brake.

The accompanying illustrations show several improvements that have, after trial, been recently introduced in the Westinghouso brake. All these improvements except the 9½ in. pump are intended for ordinary service, and will, it is understood, be supplied for new equipment instead of the former patterns. The extra large pump is, however, intended only for heavy freight service.

Throughout, the improvements are in detail and not in principle, but are sufficiently important to claim special attention, as the construction of the parts is generally simplified, the facilities for repairs increased, and the certainty and ease of operation improved.

WESTINGHOUSE 9½-IN. PUMP.

The improvements in the pump are considerable, and the changes in construction are greater than any made for many years. Not only is the size considerably increased for modern freight service, but in order to adapt the pump for the high steam pressures now in vogue, the air and steam cylinders have been made alike in size. The last pattern 8-in. pump had a 7½ in. air cylinder, but in the new pump both the cylinders are 9½-in. diameter by 10-in. stroke. The new pump is consequently rated at 65 per cent. greater capacity.

The air valves are all placed in separate chambers and are all interchangeable, though the lift varies.

The steam valve gear is all placed in the top cylinder head of the pump, and can therefore be removed or replaced far more readily than in the former construction, as the main body of the pump need not be detached from the engine or the pipe disturbed. The steam valves can also be removed without disturbing the cylinder head.

The reversing valve and rod are unchanged in construction, but the valve controlling the admission and exhaust of steam to the steam cylinder is now an ordinary slide valve, placed between two differential pistons, working horizontally.

Though the construction differs considerably in form from that of the old Westinghouse pump, familiar to railroad men all over the world, yet the method of operating without any dead points, and so as to start in any position, is so similar in the new departure that it hardly needs the following description to make it clear to our readers.

The valve controlling the admission of steam to the steam cylinder of the pump is a slide valve (No 83), operated by differential pistons 77 and 79. The pressure of steam on these pistons forces them to the position shown. The pump piston then rises until the washer 69 strikes the shoulder of the reversing stem, when it moves the reversing valve 72 upward, admitting steam through the passages *s'* and *g'* to the chamber *D* at the right of the piston 77. Chamber *E* is always in communication with the exhaust passage. The larger piston 77 then having steam pressure on both sides, and the smaller piston 79 having steam pressure on the right side only, the latter drags over both pistons and slide valve to the left, thus reversing the pump. The pump piston then moves down until the washer 69 reaches the button at the lower end of the reversing valve stem, carrying the reversing valve down to the position shown in the illustration. The steam is then exhausted from the chamber *D*, causing the differential pistons to move back again to the position shown, thus completing the double stroke of the pump.

PUMP GOVERNOR.

The improved pump governor is made in two sizes of similar construction, the 1-in. governor for the new 9½-in. pump, which has 1-in. steam pipe, and the ¾-in. governor for the 8-in. pump, which has ¾-in. steam pipe.

Some difficulty has been found hitherto in the distortion of the diaphragm beneath the plate 67, especially when the brakes were applied for some time and a high pressure had accumulated in the main reservoir. The lift of the diaphragm has therefore been regulated by the plate 67, the upward movement of which is checked by a shoulder on the cap 63. The diaphragm is then bedded against the washer 68, the lower surface of which is slightly rounded. This construction has been found to prevent any distortion of the diaphragm.

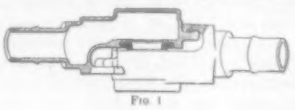


Fig. 1

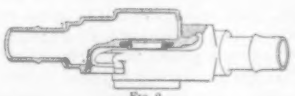


Fig. 2.

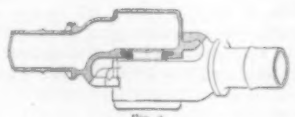
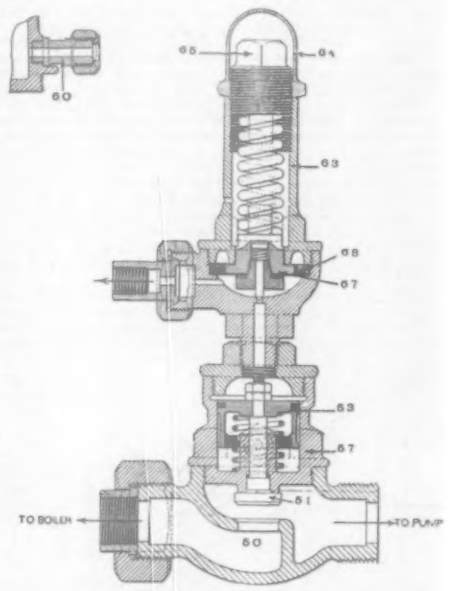


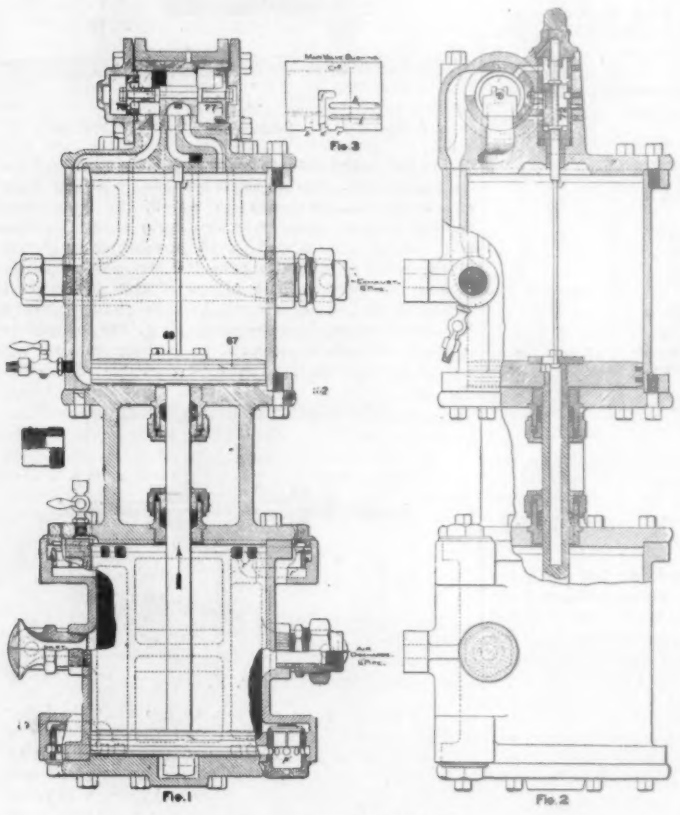
Fig. 3

Improved Hose Coupling.

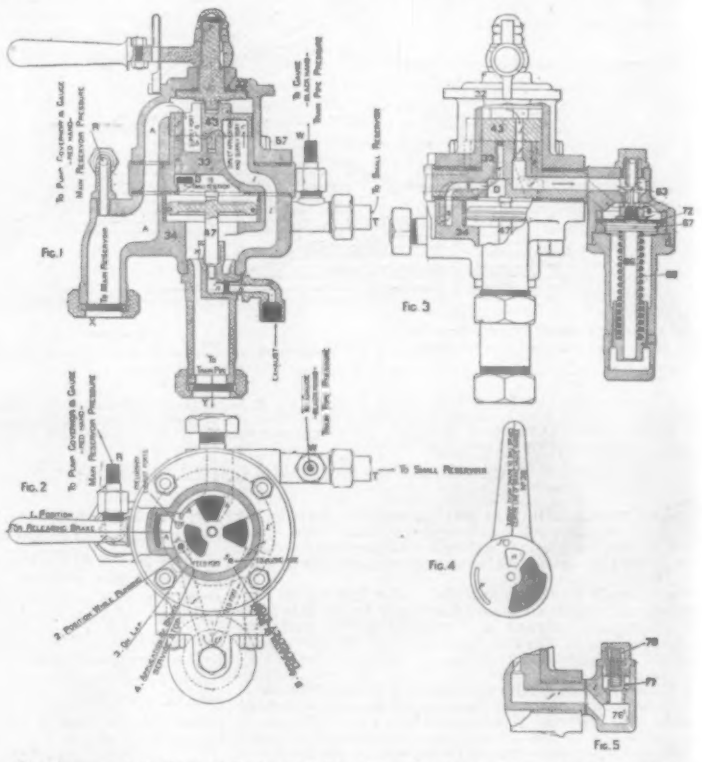
Improvements have also been introduced in other features of the governor. The valve 51 is now made without



Improved Pump Governor.



9½-in. Improved Air Pump.



The Improved Engineers' Brake and Equalizing Discharge Valve—Model of 1892.

IMPROVEMENTS IN THE WESTINGHOUSE AIR BRAKE.

wings, which in the former governor gave it a continual rotary motion if the passage beneath was coredeccentric. The valve 51 now seats against the case 57 when the valve is in its upward position, so that no steam or oil can be forced up into the chamber and blow out of the exhaust port 60. The stem of the valve 51 is now reduced in length and the piston 53 is made longer and will probably leak less than the old pattern.

The adjusting screw of the governor (65) is now protected by a shield 64, which is intended to more effectually guard against runners tampering with the governor and running the pump at pressures to suit their own individual ideas, which occasionally range to 110 lbs. per square inch in the train pipe. It is needless to say that such a pressure is very effective, especially upon the hose.

IMPROVED ENGINEERS' BRAKE AND EQUALIZING DISCHARGE VALVE.

This valve is operated in a precisely similar manner to that of the former pattern, and the construction of the main portion or lower case 34 is unchanged—the piston 47 and its functions remaining the same. Improvements have, however, been introduced in the method of feeding and in making the valve more accessible for repairs. The brakes are released by placing the handle of this valve in the release position, by which the air passes from the main reservoir (fig. 1) through the passage *A*, and thence through ports in the rotary valve and valve seat to the passage *l*, leading to the train pipe, as in the former pattern. The air passes simultaneously through the ports *j* and *e* (fig. 1) to the chamber above the piston 47, and thence to the small reservoir.

When in the running position the air passes from the main reservoir to the train pipe through the port *j* and *f* (fig. 3), under the valve 63, and thence by the dotted feed port *i* (fig. 2) to the passage *l* leading to the train pipe. When the train pipe pressure has attained a maximum of say 70 lbs. the pressure upon the upper face of the diaphragm 72 (fig. 3) overpowers the spring 68 and forces the piston 66 downward. This permits the valve 63 to seat, shutting off the flow of air from the main reservoir to the train pipe.

The application of the brake either in service or emergency stops is unchanged, but as explained above there is a considerable difference in the method of feeding. The feed valve attachment, consisting of the valve 63, piston 66, spring 68 and diaphragm 72, being substituted for the excess pressure valve formerly used. The latter, however, may be used instead of the feed valve, and the alternative arrangement is shown in fig. 5.

When the handle of the old valve was moved from the release to the running position the air could not flow to the train pipe from the main reservoir until the pressure in the latter was sufficient to open the excess pressure valve 77 against the spring 79, which maintained the main reservoir pressure about 20 lbs. above that in the train pipe. It was found, however, that on long trains the brakes of the forward cars occasionally applied slightly when the handle was moved from the release to the running position. This was owing to the pressure at the rear end being somewhat lower than at the for-

ward end of the train pipe, owing to the friction of the air and the reservoirs at the forwurd end absorbing the supply at the rear end. With the old pattern, when the handle was brought to the running position, the train pipe was cut off from communication with the main reservoir until the excess pressure was pumped up; meanwhile the air pressure in the train pipe became equalized, feeding into the auxiliary reservoirs at the rear end of the train, until the train pipe pressure there was below that of the forward auxiliary reservoirs, thus causing the brakes to apply at the forward end of the train. The feed valve attachment in the present engineer's valve is designed to obviate this difficulty.

When the handle of the engineer's valve is brought from the release to the running position, the air of the main reservoir still has access to the train pipe, through the feed valve 63, which is held open by the spring 68, and thus the train pipe is supplied with air until the pressure reaches 70 lbs., when the feed valve *gradually* closes, so that equalization throughout the train pipe takes place before the feed valve is fully closed.

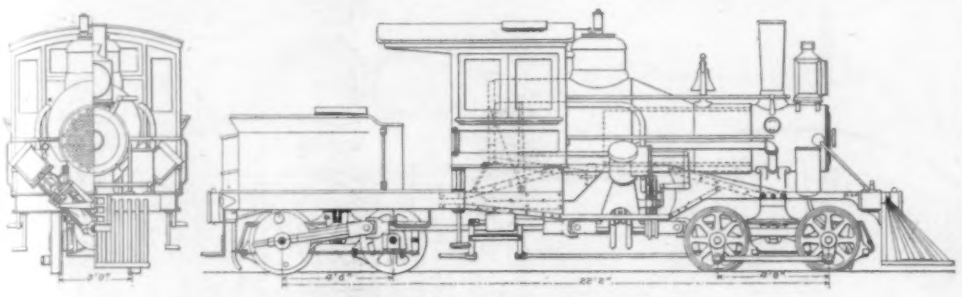


Fig. 1—Heisler's Geared Tramway Locomotive.

The advantages as regards facility of repair are as follows: The case is now made in three parts, instead of two as before. The lower part 34 (Fig. 1) has all the pipe connections so that the valve may be easily taken apart and cleaned, without disconnecting the lower case 34 from its fastening, or disconnecting any of the pipes. The upper portion of the case 32 may also be removed, leaving the portion 33 exposed and giving ready access to the seat of the rotary valve 43, which was somewhat difficult to get at in the old valve. The rotary valve is now made of brass, bearing on cast iron, whereas formerly both wearing surfaces were of brass.

IMPROVED HOSE COUPLING.

The new hose coupling is so obvious an improvement and so much simpler than the old pattern that a mere inspection of the engravings will suffice to make it clear and a description is hardly needed. The packing ring is made of a special quality of rubber and is sprung into place, no follower being required. A perfectly clear passage is thus left and no screw joint is necessary for a cap at the back of the coupling. Fig. 1 shows the improved coupling standard for passenger service, with 1-in. pipe. Fig. 2 shows the same principle applied to the signal hose coupling, and fig. 3 shows the improved coupling standard for freight service 1¼ in. hose.

The passenger and freight couplings will, of course, couple with one another, the difference being in the size of the nozzles that fit into the hose.

Heisler's Geared Tramway Locomotive.

The accompanying engravings show the general features of a class of geared tramway locomotives designed by Mr. Charles Heisler, of Philadelphia. An engine similar to that shown by fig. 1 was built by the Dunkirk Engineering Co., of Dunkirk, N. Y., and has been in service for about a year in the lumber districts of North Carolina. This engine was experimental, but its service has been so satisfactory that heavier locomotives having 12 wheels have been designed.

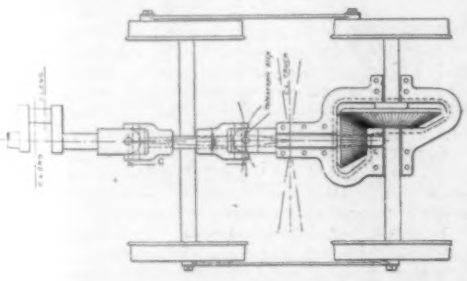


Fig. 2.

For locomotives of 15 to 18 tons weight, such as shown in fig. 1, two single cylinder engines are used, which are placed on either side of the boiler at an angle of about 45 degrees with the vertical. The engines are coupled directly to a main shaft running parallel with the boiler, which is geared to one axle on each truck. The front and back pairs of wheels of each of the trucks are connected by parallel rods.

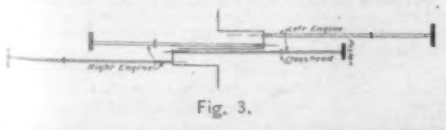


Fig. 3.

The gears and the method of connecting them to the axles are shown by fig. 2, in which the arrangement of universal joints is also shown. By reference to fig. 1 it will be seen that to provide for the inclination of the cylinders and the machinery of the engines the frames are made diamond shape between the front end and the back of the firebox. In the design for the heavier locomotives, weighing 60 tons, there are two double cylinder engines arranged similarly to the single cylinder engine shown in fig. 1, but the main shaft has in that case two cranks set 180 degrees apart, the arrangement of the different parts of the double engines being as shown in the diagram, fig. 3. This 60-ton locomotive has three sets of four-wheel trucks, the wheels of each truck beng coupled by parallel rods. This locomotive differs from the Shay locomotive, which was described in the *Railroad Gazette* of May 8, 1891, in the position of the cylinders and the method of gearing the main shaft with the axles. In the Shay locomotive all the axles and wheels are geared directly to the main shaft and the cylinders are placed vertically on one side of the engine.

Disputed Points in Railroad Bridge Designing.

Mr. J. A. L. Waddell in pursuit of his effort to bring about certain reforms in the methods of proportioning and designing railroad bridges has issued a circular and form of ballot addressed to about 250 engineers. We print below the greater part of the circular, which explains itself. Mr. Waddell's paper on the subject, and the discussion so far had, have already been published in the *Transactions* of the American Society of Civil Engineers and by copious abstract in the *Railroad Gazette*, and presumably most of those to whom the circular will be sent are already familiar with the matter. Perhaps those who care to take much part in the discussion have already done so, but Mr. Waddell's present enterprise gives a chance for an expression of opinion by those who do not care to go into discussion. Probably it will be freely used.

This circular will be sent to every chief engineer of a railroad in the United States and Canada who is a member (in any grade) of the American Society of Civil Engineers, and to every member of that Society (in any grade) who, to the writer's knowledge, is connected with or specially interested in the designing, building or operating of railroad bridges.

ABSTRACT OF THE CIRCULAR.

I have for some time been intending to attempt to settle certain "Disputed Points in Railway Bridge Designing," discussed in my paper of that title, which was published lately in the *Transactions* of the American Society of Civil Engineers, by obtaining a concensus of opinion thereon from those engineers who, from either practical experience or deep study, are best qualified to give such opinion. My object in writing you, therefore, is to ask that, as a professional courtesy, you will aid me in the task which I have undertaken, by giving the points at issue your attention, indicating your views upon the enclosed ballot, and returning said ballot to me, with permission to use it as I may see fit in accomplishing my object. . . .

The points upon which I request your opinion are as follows: First—The most preferable method of computing live-load stresses, or, in other words, whether to adhere to the method of wheel concentrations now in vogue, or, to adopt a constant carload, preceded by a single locomotive excess-load; or, to adopt the equivalent uniformly-distributed load method that I have advocated in my paper. Second—The adoption of certain standard engine and train-loads to cover all cases. Third—The advisability of making an exhaustive set of experiments to ascertain the dynamic effects of live-loads applied at various speeds on bridge members of all kinds. Fourth—The advisability of making an elaborate series of tests of full-size members of steel bridges, especially compression members of all kinds. Fifth—Ultimately, the adoption by the profession of standard specifications for bridge designing, which shall specify clearly and concisely in every particular such important matters as loads, intensities of working stresses, quality of materials, workmanship, etc., but at the same time shall not infringe upon the individuality of the designer. In case you wish to see what has been written on any of these various subjects, I insert the following list of references; but there is no necessity for you to use it unless you so desire. . . .

As supplementary to all that has been written up to date, I desire to make the following remarks concerning the various items:

ITEM 1.—There seems to be a misapprehension on the part of a number of engineers, in respect to the amount of labor involved in the "Equivalent Uniform Load Method," their plea being that it gives about as much trouble to compute the equivalent loads as it does to calculate the stresses for each case by wheel concentrations. These gentlemen do not perceive that what I propose is, after standard train-loads have been adopted to insertin all bridge specifications of railroad companies diagrams of equivalent uniformly distributed loads for all spans and all standard train-loads, and to indicate in each of said specifications which one of the standard loads is to be used. Moreover, I have promised to compute, or have computed and checked at my expense, and within a reasonable time, all the equivalents for any system of standard train-loads adopted by the profession. There would be but three diagrams needed. The first would give total end shears for all plate girder spans up to 100 ft.; the second, equivalent uniformly distributed loads obtained from mid-span bending moments for all plate girder-spans up to 100 ft.; and the third, equivalent uniformly distributed loads for truss-spans from 100 to 150 ft., established for each case by proper compromise in respect to variations for theoretical correctness, as indicated by my letter published in the *Railroad Gazette* of Sept. 23. Although the general opinion of bridge engineers appears to be that the time has come for abandoning the cumbersome and tedious "concentrated-wheel-load method" of calculating stresses, nevertheless there appears to be some uncertainty as to whether it will be better to adopt the method of equivalent uniformly-distributed loads that I propose, or a single constant car-load per lineal foot, headed by a single locomotive excess-load. I have made, or have had made and checked to me, of late, a number of calculations bearing upon this subject, and have deduced therefrom the following conclusions: First. That for any practical combination of locomotive and car-loads, the equivalent uniform-loads can be so adjusted, in respect to variations from theoretical correctness, that the greatest errors caused by the use of the diagrams of said equivalent uniform loads shall always be within reasonable limits, say not to exceed two, or at most two and a half per cent. (excepting, of course, in the case of counters, where the variations are, fortunately, larger, and always on the side of safety). Second.—That no combination of a constant car load per l neal foot, and a single locomotive excess can be made, which will give errors from theoretical correctness as small as twice the errors of the preceding equivalent uniform load method. Third.—That if it be decided to adopt the method of constant car load per lineal foot, headed by a single locomotive excess load, it will be necessary to use two such excess loads, one for plate girders and the other for trusses, and even with these the variations from theoretical correctness would be excessive. In view of these facts, and of the further fact that the "constant-car-load-with-single-excess" method involves just about twice as much labor for the computer as does the equivalent uniform-load method, it does not appear advisable to adopt the former in preference to the latter.

I wish to call special attention to the fact (*vide* p. 272, *Trans.* Am. Soc. Civ. Eng's, Vol. XXVI.) that, on account of the discussions, I have decided to adopt for spans of 15 ft. and under certain extra-heavy concentrated loads, and to insert their effects in my diagrams of equivalent loads and end shears.

Item 2. My proposed standards appear to have met with considerable favor, bnt a number of modifications have been suggested, the principal of which are the following: A. An increase of load on wheels of tenders. B. A lengthening of the engines at the car-load increases. C. An increase in weight of engines as compared with weights of cars. D. The addition of two or three train-loads for mountain lines, in which the engine-loads shall be heavy and the car-loads light. In respect to "A," I await the opinion of the profession. In respect to "B," I would be sorry to change lengths of engines and wheel-spacings, unless there be necessity for same. Increasing the engine weights as I have done, without lengthening the engines, constitutes an error on the side of safety, if it be an error.

In respect to "C," I believe that my arrangement of ratios of weights per foot of engines and weights per foot of cars (excepting, perhaps, for mountain lines) is just about right. Nevertheless, I am open to conviction.

In respect to "D," I am still undecided as to whether it be advisable to provide special loads for mountain lines, on account of the reason given in my letter published in the *Railroad Gazette* of Sept. 23, which reads as follows:

"Have we not all of us of late been attributing too much importance to the difference in weight per foot of engines and cars in trains for mountain loads? Of course, on such roads the engines have to be heavy, and the total weight hauled must be comparatively small. But what authority have we for saying that the carloads also must be small? Is it not more likely that the weight of the train will be reduced by curtailing its length, than that the same effect will be accomplished by unloading the cars? Cars loaded heavily in the East, where grades are light, are often transported to the far West over mountain roads; and there is no reason for believing that any mountain road will not at some time carry full, though short, trainloads of these heavily-loaded Eastern cars. On this account, it might be well to have no special standard train loads for mountain lines, but to use for each road that class of my proposed standards having engines most nearly identical with the heaviest employed on the line. This, however, is a question to submit in circular which I purpose sending to railroad and bridge engineers, and concerning which I spoke in my last communication."

In my opinion, it is advisable, in establishing a system of standard train loads, to make the various train loads as similar to each other in respect to wheel-spacing, increments of changes in wheel and carloads, etc., as possible; and I would suggest that you bear this feature in mind when deciding upon the questions under this "item" in the ballot slip.

ITEM 3. I am in hopes of being able to interest some public-spirited man of great wealth in this subject, to such an extent as to induce him to furnish the money for the experiments. Failing in this, I see no other method of obtaining said money, except through an appropriation from Congress. The obtaining of such an appropriation would not be extremely difficult, if the measure were properly indorsed by the engineering profession.

ITEM 4. The remarks under the last item will apply also to this one.

ITEM 5. Although I believe most firmly in the advisability of ultimately establishing standard specifications for railway bridges, nevertheless I think that it would be a great mistake to attempt to establish them at present, for the questions involved in "Items 3 and 4" ought to be first settled satisfactorily.

In view of the great importance to the engineering profession of the subjects treated in this letter, I would again urge you earnestly to comply with my request to express your opinions on the inclosed ballot and return same to me. It is my intention to summarize the results of the ballot, and to prepare from the consensus of opinion thus obtained, a compromise standard for train loads, then submit this compromise to each member of the profession to whom I have sent a copy of this circular, in order, if possible, to obtain a practically unanimous vote favoring said "compromise" standard. Should pou have misplaced your copy of my paper on "Some Disputed Points, Etc.," and will notify me to that effect

I would be pleased to send you a copy, as I have a number of them on hand for this special purpose.

The forms of ballot are very convenient, but it is hardly necessary to publish them here.

The Dean Compound Locomotive.

We illustrate herewith the details of the more important features of Mr. F. W. Dean's latest design for two cylinder compound locomotives. It will be remembered that Mr. Dean's system, which was patented Sept. 22, 1891, and May 3, 1892, comprises a converting valve and intercepting valve and a large receiver of special design. The general arrangements of the pipes, valves, etc., in the smokebox are shown by the general drawing, Fig. 1, from which it will be seen that the intercepting valve is placed on the high pressure exhaust pipe where it branches to form the two parts of the receiver. The details of the intercepting valve are shown by fig. 2, and those of the converting valve by fig. 3. The latter is intended to be placed on the high pressure steam chest cover and is connected to the intercepting valve through the openings as shown, the arrangement being similar to that adopted in previous designs but more compact The places for connecting these pipes to the two valve casings are clearly shown by the drawings.

The receiver is made of cast iron, is ribbed, and has a very large capacity. Without going into the details of the finer adjustments of the valves, we may say that when steam is admitted to the high pressure cylinder it will be also admitted below the converting valve and will raise this into the position shown in the detail drawing. At the same time by means of the cored passage in the converting valve casing and the connecting pipe, steam is admitted to the top of the intercepting valve through the central passage and closes this valve. When this valve is closed the openings shown at *A A* in fig. 2 are uncovered and steam is thus admitted to the receiver and hence to the low pressure cylinder. When the back pressure on the high pressure side of the intercepting valve increases sufficiently it acts upon the top of the converting valve and closes it, thus shutting off the direct supply of steam to the receiver and low pressure cylinder and the intercepting valve is then lifted by the live steam that is constantly in the annular space of the intercepting valve. The starting steam which held the intercepting valve down is at the same time exhausted into the atmosphere. The intercepting valve is prevented from falling on its seat when the throttle is shut and the engine is running without steam, by the live steam in the annular space. This steam comes from the boiler by a small independent pipe. Both valves are prevented from slamming by efficient cushions.

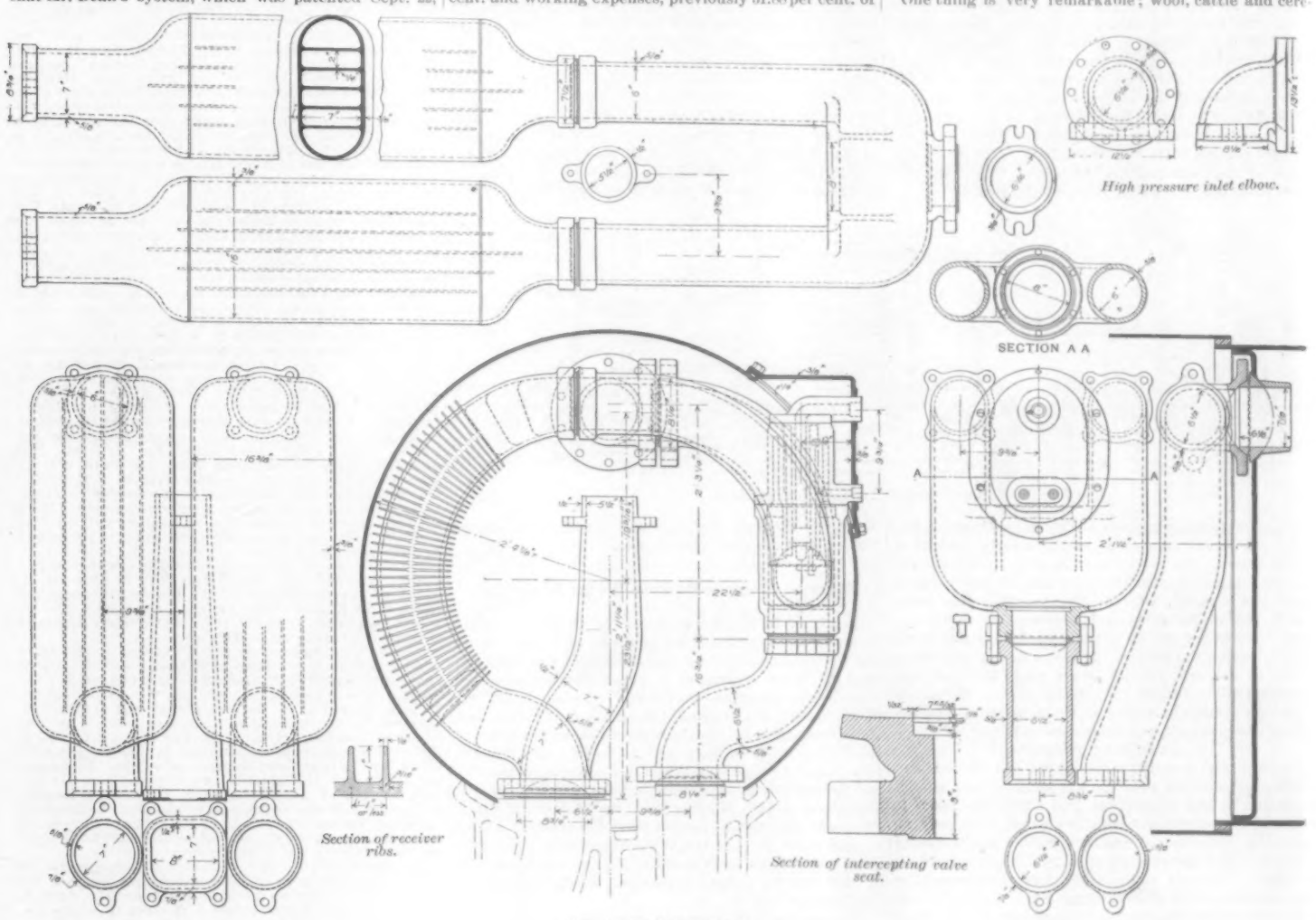


Fig. 1—Smokebox Pipes

THE DEAN COMPOUND LOCOMOTIVE.

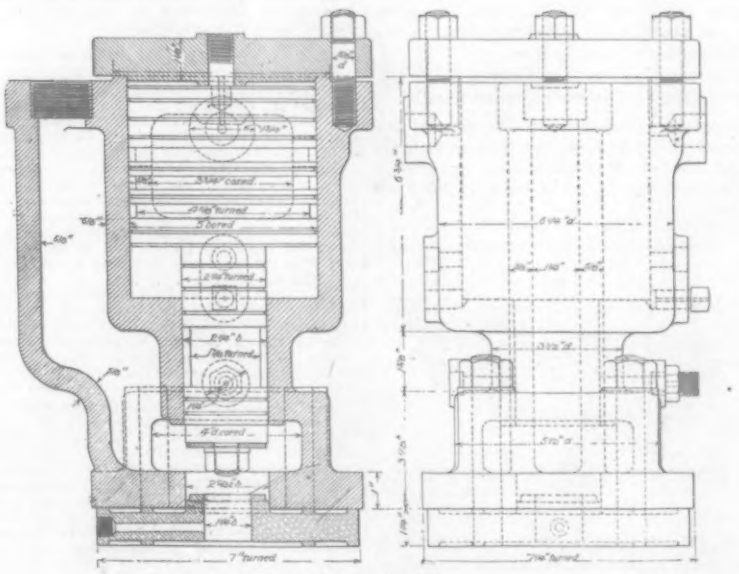
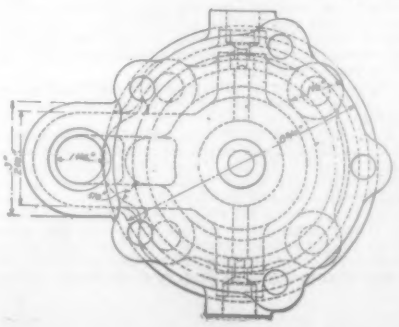


Fig. 3—Converting Valve.



An Argentine Railroad Report.

The report of the Buenos Ayres Western Railroad for the year ending June, 1892, is of interast as showing what can be done under unfavorable conditions in reducing expenses. It caused a general rise in price in London of all the Argentine railroad securities when it was issued. As compared with the previous year there was a decrease in the gross receipts of a little over 10 per cent. and yet the net profit increased by 2.31 per cent. and working expenses, previously 51.88 per cent. of gross receipts, were brought down to the low figure of 45.26 per cent., and this was in face of a reduction in both passengers and freight, the train mile receipts falling from $1.98 to $1.88. At the same time the train mile cost was reduced from $1.03 to $0.85.

The falling off of receipts is attributed to the continued depreciation of the currency and the impossibility of collecting the whole of the railway gold revenue, so that the average fare per passenger works out as 28 cents against 39½ cents in the previous year.

One thing is very remarkable; wool, cattle and cereals, the staple produce of the country, show a large increase, and this appears to indicate that the Argentine Republic is in a really sound and prosperous condition, its difficulties being those of government and not due to any inherent poverty of the country itself, or to any lack of producing power. But people have economized, and following is a résumé of the passenger traffic in the two past years, which shows a larger travel but less receipts from it:

	1890-91		1891-92	
Single.	No.	Amt.	No.	Amt.
1st class.....	387,805	*$318,380	412,275½	*$273,272
2d class	458,447½	230,298	305,047½	226,658
Return.				
1st class	707,699	157,664	847,314	114,129
2d class	330,984	62,208	392,230	46,641
*Basis, £1=$5.	1,854,935½	$768,550	2,246,867	$660,690

This railroad was constructed by British capital and worked by British rolling stock and generally conducted on English lines, and affords another proof of what must be taken almost as an axiom that the more settled a country becomes the greater is the difficulty in keeping down expenses. This little line at a jump brings down its working expenses ratio to total receipts from 51 88 to 45.26 at a period of great difficulty. Lines worked in England and with increasing traffic cannot do this. The cost of construction in large cities seems to more than swallow up the gain of traffic, due to increased accommodation, so that we have the Great Eastern paying a dividend of three-quarter per cent. and the Buenos Ayres Great Western not only paying 2½ per cent. but paying off last season's deferred dividend in cash.

It is to be noted, and this is a point to which attention may very well be directed, that fewer train miles have been run to carry 21 per cent. more passengers and very much more freight, there being an increase of animals of 157 per cent. and of nearly 4 per cent. gross weight of freight, only three items showing a decrease, namely, hay, stone and general goods, these latter chiefly imported articles. The vehicles per train increase from 20.03 to 22.34, which more than makes up the loss of train mileage and trains were run fuller, an increase of three passengers per train being secured; all of which is in the direction of economy, and in spite of what are hoped to be only temporary difficulties there is a net gain of 7 cents per train mile.

The results are said to have been accomplished without sacrificing the good condition of the road or of the rolling stock.

It is stated that the proposed extension of 65 miles will probably be effected for $1,050,030, or at the rate of $16,154 per mile.

No particulars as to the number of locomotives appear in the report; but throughout the abstracts of expenditure there is reduction in almost every item, due, apparently, to an economy as rigid as good maintenance would allow.

	1890-1.	1891-2.
Miles open	338	338
Receipts per mile	$7,179	$6,457
Total passengers	1,854,935¼	2,246,806
Number of passenger trains	25,550	29,504
Train miles	1,172,0·2	1,116,598
Passengers per train	73	76
Receipts per passenger	39½ cts.	28cts
" " ton of freight	$1.92	$1.72
Wagon miles	23,477,274	24,948,050
Receipts per train mile	$1.985	$1.875
Expenses " "	$1.03	$0.85
Profit " "	$0.955	$1.025
Per cent. of expenses to receipts	51.88	45.26
Total receipts	$2,426,701	$2,182,427
Total tonnage	743,577	772,580
Number of animals	236,568	608,584
Receipts—freight and animals	$1,658,151	$1,573,843
Average gold premium	2½	2⅝

The Long-Distance Electric Installation at Rome.

The much-talked-of electric installation by means of which the city of Rome is supplied with light and power from Tivoli, 16 miles distant, was formally completed in July of this year. The work was in the hands of the well-known electric firm of Ganz & Co., of Buda Pest, and was designed to supplement the electric plant, installed about six years ago by the Rome Gas Co., and which has a capacity of about 2,700 H. P., steam being used for the motive power.

Tivoli has a wide reputation for its large waterfalls and for a long time these have been utilized for a number of small establishments. Since 1887 there has also been at Tivoli a small electric plant, supplying the town with light, and at that date plans had already been entertained to establish there a large central station for supplying current to Rome. In 1888 the matter was again taken up by M. Pouchain, of the Rome Gas Co. The works already executed were bought up by him, what opposition remained was successfully overcome, and the completion of the undertaking was pushed forward.

The water falls utilized are the smaller ones, situated below the town; the available head being about 361 ft., with a volume of water of about 131 cu. ft. flowing per second. Of this available head, about 33 ft. was already used for local purposes, thus leaving about 5,000 gross H. P. The water is used in three groups of three Girard turbines each, each turbine being rated at 330 H. P. To each group of turbines was added another smaller turbine, of about 50 H. P. Each of the large turbines is coupled directly to an alternating dynamo, which, at a speed of 170 revolutions a minute, gives a current of 42 ampères and 5,100 volts. The small 50-H. P. turbines work the exciters for the dynamos. The exciters, at 375 turns a minute, yield a current of 150 ampères at 180 volts.

The 16-mile transmitting line, running as it does through the dreary Campagna, was made particularly substantial. It consists of four copper cables, made up of 19 wires each, and a little over an inch in diameter. About 100 tons of copper were used in the line. Three of the cables are sufficient to transmit the full power, and two of them will accommodate two-thirds of the full normal load. There is thus ample reserve capacity. With five of the dynamos working at full capacity the loss in transmission amounts to about 20 per cent.

The cables are supported at intervals of from 115 to 131 ft. by oil insulators. These are carried on 10-ft. cross arms on the tops of stout posts, made of two T-irons riveted together. Along these posts are also strung four silicon-bronze wires for telegraph and telephone purposes. The minimum distance of the wires above the surface of the ground is about 23 ft.

On reaching Rome the line enters a transformer building in which the voltage is reduced to 2,000, this being the voltage with which the already existing Rome installation is working. Thirty-two transformers, or converters, are used in two groups of 16 each, and the current is distributed by underground cables. During the summer months, and, in fact, at all times of low current consumption, the supply necessary for the city of Rome is to be furnished by the Tivoli plant. The steam plant at Rome itself is to be used as a reserve to make up any deficiency of current at times of heavy consumption.

The whole plant is of special interest when it is considered that the Lauffen-Frankfort high-tension, long-distance installation, in Germany, must be regarded properly as only a temporary one, and when it is borne in mind that the Tivoli project was put on foot as far back as 1888, when the industrial utilization of 5,000-volt currents was looked upon as something extraordinary.

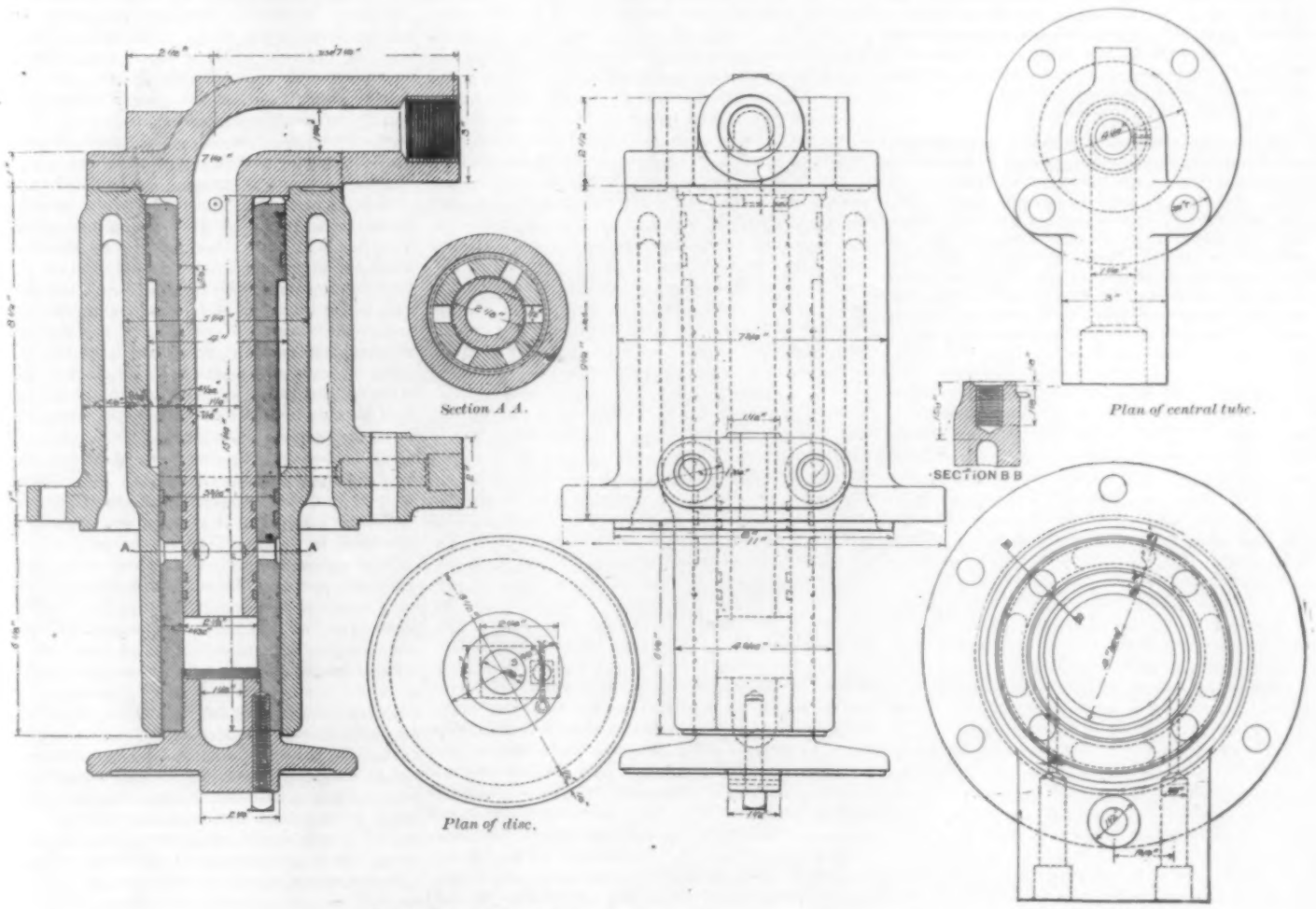


Fig 2—Intercepting Valve.

THE DEAN COMPOUND LOCOMOTIVE.

Tender Forms in England.

The Bombay, Baroda & Central Indian Railway Co. lately issued an advertisement asking tenders for supplying certain goods on forms issued by the company, for which forms five shillings were charged. A Sheffield man, by the name of Woodcock, remitted this sum, and received a tender form; but, not liking the conditions, he decided not to attempt doing business with the company, and sent back the form uninjured, asking a return of the five shillings. This was refused, and Mr. Woodcock sued the Bombay, Baroda & Central Indian Railway Co. for the money. The Court held that he could not recover.

Pacific Railroad Debts.

The special report of Commissioner of Railroads H. A. Taylor relative to the Senate bill providing for the funding of the debts of the Pacific Railroad, which he has made a part of his annual report, has been received by Secretary Noble. The report shows that there were bonds issued in aid of these roads in the following amounts: Union Pacific, $35,139,512; Central Pacific, $27,855,680. There has been paid by the United States in interest on these bonds to Dec. 31, 1891, in excess of payments made by the companies in reimbursement for Union Pacific, $20,360,946; for Central Pacific, $27,233,432. Total amount due the United States Dec. 31, 1891, from Union Pacific, $55,500,458; from Central Pacific, $55,089,112. The subsidy bonds begin to fall due Jan. 16, 1895. First mortgage bonds amount on the Union Pacific to $35,702 000 and on the Central Pacific to $27,853,000. The Commissioner reviews the bill pending before Congress at length, and suggests several amendments. The general purpose of these is the extension of the debt to 100 years with interest at two per cent., and a certain portion of the principal to be paid at the expiration of each six months during that time so that at the end of 100 years the entire debt will have been extinguished. The bill as amended, the Commissioner believes, would, if enacted into law, fully protect the interests of the government, and secure the final payment to it of all the money, principal and interest due from the bonded roads

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday.
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The use of air brakes on freight trains is the subject of an interesting paper recently read at Buffalo by Superintendent Roberts, of the Philadelphia & Erie, and printed in another column of this paper. It is scarcely necessary to remind the reader that this important subject presents three principal problems, or rather one great problem in three stages. The first stage, that concerning the design of an air brake suitable for freight trains, has been practically settled by Mr. Westinghouse. The second stage is that incident to the transition period. For several years we must deal with long trains, in which part of the cars are equipped with air brakes and part are without them. The aid in handling a train afforded by a power brake is so valuable that it is almost universally deemed unwise to let an air brake on a freight car go unused, and it is now common to put the air braked cars next to the engine and use the air. But such use involves a certain risk of derailment. A train may be handled with the best of care and yet the breaking of a draw bar, or the rupture of an air-hose from some other cause, may apply the air brakes with such force as to stop the front portion of the train so suddenly as to derail the rear cars when they, their momentum being unchecked, suddenly press against those in front. The third stage is that discussed by Mr. Roberts It is incident to the transition period, but is not, like the second, inevitable. Trains are stopped too suddenly when there is no breakage of couplings and no failure of apparatus, and the question is whether this can be cured by more thorough instruction of the enginemen and brakemen. As far as the Philadelphia & Erie is concerned the difficulty may be largely owing to the small *percentage* of air-braked cars. Twenty of these in a train of 100 cars constitute only one fifth. But only a few roads run such enormous trains. Where 40-car trains are the usual maximum the natural remedy would be, supposing one fifth the cars had air, to hold those cars for the next train and run the first train without air, thus securing two-fifths air in the other. But this does not settle the whole question and, as we see by the discussion of Mr. Roberts' paper, all roads are interested in the matter. Quite likely Mr. Roberts, with his 80-car trains, is right in discontinuing the use of the air; that may be the wisest course, with such trains, as a safeguard against the risks which we have classed under the second head. But how about the third branch of the question on the "average" road? If we are to use air brakes at all there can be but one answer, and that is, improve the discipline. Does any one claim that an air brake cannot be put on lightly? If it can be put on lightly wherein is the danger in its proper use? We cannot forbid enginemen to take up the slack of the train at all, for the application of the tender brake, by hand, is enough to do that. The slack can be taken up just as gently with the air; and after that the special danger is past. The trouble is, as was remarked by one speaker at Buffalo, that many enginemen, especially new ones, will do as they please, in spite of instructions, unless they are watched. Why not watch them, then?

The Trunk Line presidents evidently believe that it is not expedient under the present law to try anything in the shape of a pool for the purpose of keeping the peace among their freight agents, as their action in regard to differential rates, which was reported last week, has been extended to include practically all the competitive freight subject to the supervision of the Association, as will be seen by our traffic columns in this issue. There is no evidence, indeed, that there ever was any prononnced sentiment among the presidents in favor of establishing a pool in the face of the fifth section of the interstate commerce law; but the idea has no doubt been discussed; and in view of the divergent, if not loose, views among railroad men, as well as others, on the subject, it is worthy of note that this decisive action has been taken. The roads between Chicago and Kansas City have for a year or more done more or less in the way of diverting competitive freight from one road to another (or rather in authorizing the Commissioners to divert), and have not been punished as law-breakers, or even been questioned about the matter by the Interstate Commerce Commission; but the Trunk Lines do not seem to care to repeat the experiment. This seems rational enough, for diversion is so nearly like pooling that any one desiring to obey the spirit of the law against pooling would doubtless vote not to practice diversion. On the other hand the Chicago experiment was so unsuccessful that many of the Trunk Line men concluded, no doubt, that an arrangement to vary, from month to month, the advantages accorded the weaker lines in the shape of lower rates, could not be any *less* satisfactory than the Western scheme. Agreeing upon differentials is not only clearly within the law, but may be said in a sense to carry out the law-makers' ideal. What they wanted was the advantage of competition, and what is this but friendly competition? Surely no Congressman who poses before his constituents as the embodiment of all that is good can ask that only cut-throat competition be recognized as the genuine article. He is bound to approve the employment of lambs in the place of wolves as traffic managers. The question about the present scheme is not concerning its legality but concerning its effectiveness. A pool provides for a positive recompense in the future for loss of traffic now. A promise that your powerful competitor will give you some of the freight that he has secured is nearly as good, in theory, though it encounters snags in practice. To give you the freight, he must find shippers who will make no objection to the diversion, and who will not be likely to transfer their affections from him to you in consequence of this unsolicited introduction to you. A promise of a greater differential is simpler than diversion—simpler, even, than a pool; but it still leaves a feeling of uncertainty, and it takes time for its effects to show themselves. The Commissioners must know accurately, from monthly reports, how freight has gone before they can decide how it ought to go, and after they decide that you may reduce your rates, say, five per cent., commercial conditions may change so that even a ten per cent. reduction would not have the desired effect. But the coming experiment will be watched with great interest, for it is quite possible that we have learned enough in the past five years to work such an agreement more successfully than in former times.

Passenger Rates to the World's Fair.

The position taken by the New York daily papers toward the recent action of the Trunk Line Presidents in the matter of New York-Chicago World's Fair rates is one-sided and inconsiderate, but not altogether surprising. The papers express the sentiments of New York merchants and hotel people, who hope that the World's Fair will bring a great deal of business to New York, and it is a popular thing to attack the railroads anyway. But we had hoped that some of these papers would have gone a little deeper into the subject before passing judgment. The action of the Presidents was to maintain rates on all trains scheduled at less than thirty-five hours, and to make a 20 per cent. reduction on all trains slower than thirty-five hours. The newspapers say that this action is illiberal, that it is contrary to public interest and that it will tend to reduce earnings in the end. The last assumption is a mere matter of opinion, and very ill-informed opinion at that. As to the liberality of the matter, we have not discovered any class of business men who voluntarily reduce prices when they have more orders for their wares than they can fill. Looked at simply as a matter of dollars and cents, the Presidents have probably acted in the interest of their security holders, and the public may be thankful that rates have not been raised instead of being reduced. But even as a matter of public policy, the action of the Presidents, if it can be maintained throughout the whole season of the World's Fair, is probably wise.

In thinking of this matter it should be remembered that we are not dealing with an episode of a week or two weeks, but with a situation that is to last for six months. A passenger business immensely above the average can be handled by a railroad for a few days without great public inconvenience or loss. That it can be handled for months without such inconvenience and loss, not to the railroads alone but to the general public, is probably not true. Taking all of the railroads of the country together, the earnings from freight are more than two and a half times as much as those from passengers. Taking the eleven lines of the Trunk Line Association, their freight earnings are three times as much as their passenger earnings. This gives a notion of the relative importance of the two classes of business; and so far as this country is concerned, and indeed we may say the whole world, it is probably of more importance that the freight traffic should be handled regularly and quickly than that the passenger traffic should be increased, or facilitated, or carried at lower rates. A man can stay at home and do his business by mail and telegraph, but he cannot do business unless he can rely upon his freight being moved promptly and regularly. The business interests of New York would doubtless be benefited by the flow eastward of a large number of the people from the interior who visit the World's Fair. They would be benefited, also, by the large flow of foreigners through that port going west to see the World's Fair. The maintenance of high passenger rates would diminish this flow in either direction somewhat: but a serious derangement of the freight business would injure the business of New York far more than it could be benefited by a transitory increase of the receipts of the hotels and the retail shopkeepers. By the way, in all this talk, we have not heard that the New York hotels propose to promote just this increased travel by reducing rates, nor have we heard that any similar proposition has been made by the New York merchants.

But the most serious question that now confronts the managements of the railroads between New York and Chicago is, how to carry the greater number of passengers that they are certain to be obliged to carry next summer, without seriously deranging the movement of freight. They can provide equipment to carry more freight and more passengers, but what are they going to do about main line tracks on which to move a greatly increased number of trains and what are they going to do about yards and sidings at the terminals and all along the lines? To increase these facilities takes not only a good deal of money but a good deal of time. Furthermore, supposing they had the money and the time to provide additional rolling stock yards, sidings and even second, third and fourth tracks, who will pay interest on that investment after next October?

At this moment more than one of the great railroads is prepaing schedules for the movement of trains next summer. One of the plans proposed, which is a development of excursion methods, is that the bulk of the passenger trains shall be started out in convoys; that is a number of trains will be started, one or two blocks apart, and run through at these intervals. Then the tracks will be comparatively free for some hours for the movement of freight trains. But what will the public and the newspapers say to this? Everybody does not want to start for Chicago at the same hour, and the convoy notion will be at once condemned by many as diminishing public convenience. Logically one would say that, if a man does not want to start at the hour most convenient and economical for the railroad, he ought to be willing to pay more for the privilege of starting at the hour most convenient to himself. And he will still have a chance to do so, as the fast trains starting at various hours through the day will not be taken off, but will very likely be increased in numbers.

The 35-hour trains are spoken of with some scorn, but it is only a few years ago that these were thought to be very luxurious trains; and in fact between 35 hours and 24 hours there is not very much choice for most people. It is convenient to be able to go from New York to Chicago or Chicago to New York in one business day and one night, but if one makes up his mind to spend more time than that on the journey, he prefers to take one business day and two whole nights. He would rather take that time than to take fewer hours, and start or arrive in the middle of the night or at some very uncomfortable hour in the morning. There is still

another consideration. It is more agreeable to travel at low speed than at high speed, so far as the comfort of the journey goes; there is less motion, less car sickness, and less fatigue. Therefore, for the great mass of people who may be expected to move between New York and Chicago for pleasure, 35-hour trains, or 36-hour trains, or even 37 or 38-hour trains will provide very adequate and comfortable accommodation. Those whose time is very valuable can afford to pay a higher rate and travel by quicker trains. Those who wish to travel by quicker trains as a mere matter of luxury ought to pay a higher rate.

But there is still another very important consideration, and it is one, which so far as we have seen, the daily press has ignored, that is the safety of the increased passenger movement. For reasons of safety alone, the railroad companies would do themselves and the public a great wrong if they undertook to move many more fast passenger trains than they are now moving. Somewhat higher speeds could be made on some of the roads without danger. Some additional fast trains could be put on without much increase of danger, but there is no use in saying that fast trains are as safe as slow ones. They are not. They are more dangerous in themselves and they are more dangerous to other trains. Therefore the chief increase next summer should be in the slower trains, and this is exactly the result that the Trunk line Presidents seem to be looking forward to, and in this respect their action is not only wise, but it is really courageous in the face of what they knew would be an adverse public opinion. Instead of blaming them we ought to thank them for having had the strength to take a position which they knew would be unpopular, but which will tend to the greater safety of those who travel.

There are still other considerations which might be brought up in support of the position of the trunk lines. Really it is not entirely certain that it would be for the interest of the public or for the interests of the Fair that the greatest possible number of people should be carried into Chicago. It would be a very wholesome thing if there was a little hotel room to spare in that city during the summer. The outlook now is that there will be no limit or moderation in the hotel charges. Furthermore, it does not seem to be at all certain that the railroads centring in Chicago will be prepared to handle the masses of people that are sure to be poured in there whether rates are high or low. Judging from the facts as they are now, we should say that the physical limit to handling passengers there will be reached a good while before the passengers cease to multiply.

But, after all, this question of World's Fair rates between New York and Chicago is not yet settled by any means. The roads are still at liberty to put on as many 36-hour excursion trains as they choose and there still remains the fact, always before us, that if some of the less popular lines find their cars running light there will be cuts in rates that will upset the present plan, and then a new arrangement will have to be made. We may rest assured that each road will build as many new passenger cars as it believes can be used, subject only to the limitation that they must not be "dead wood" kicking around in the way after the Fair is over; and that prices will be made low enough to keep these cars constantly in use.

Special Locks for Signals Near Cross-Overs.

A special lock for locking a home signal when a train standing under its protection has to wait some time and is, therefore, liable to be forgotton by the signalman, has been devised by Mr. R. G. Marks, of the Lancashire & Yorkshire, and it has been in use for some months at Wakefield, Eng., on that road. The appliance is placed upon a shelf behind the levers in the signal box and under the instrument shelf, and consists, chiefly, of a pivoted arm having a catch piece at its outer extremity. This catch is made to engage with the cross-over lever, which it thus locks. When it is required to pull this lever over, the pivoted arm is pushed aside. This action automatically locks the home signal levers, so that the signalman cannot accidentially pull these levers over and so, by forgetfulness, show a line clear which in reality has a train standing on it. The London *Times* states that the success of the test on the Lancashire & Yorkshire has led to the company's agreeing to its general adoption on that line. The officials of the Board of Trade also have so far indicated their approval of Mr. Marks' invention as to consent specially to inspect its working.

It will be remembered that a very bad collision, due to the forgetfulness which this invention is designed to prevent, occurred at Norton-Fitzwarren, Eng., Nov. 11, 1890.* A southbound freight was set upon the northbound track to wait for a passenger train, and while standing there was run into at the front by a fast northbound passenger train. While it is perhaps useless to discuss fine differences whose importance can be determined only by the results of long experience, it certainly seems from a theoretical point of view that the use of a staff, suggested at the time of the Norton-Fitzwarren collision, is a better safeguard than Mr. Marks' arrangement alone. Conductors and enginemen would be instructed to never use a crossover until they first got possession of the staff and the staff could be given out only after locking, in the danger position, the signal protecting the track to be used by them. In Marks' device the signalman simply has an additional lock on his signal levers, so that after a train has used a crossover (but still fouls the main track) he can reset the switches for the main line while still leaving the signals locked; whereas under the ordinary locking the placing of the switches in their normal position *unlocks* the signals. With the proposed staff system he not only has the special lock, but, during the critical period, puts the key to it out of his own reach. Possibly this may not be necessary for the purpose of making him strict in keeping the levers locked, but it would certainly give the freight conductor and engineman a feeling of confidence not otherwise secured. The critic may answer that the conductors and enginemen would neglect to ask for the staff, but with adequate discipline that should hardly be an objection.

So much for a plain mechanical guard against forgetfulness; but many American railroad officers would say that the signal levers should be locked by an electro-magnet, controlled by a circuit running through the rails occupied by the standing train. The lever would never be unlocked except when the electro-magnet was closed by the passage of the current throughout the circuit, undisturbed by car wheels. Experience with rail circuits seems to show that with a roadbed containing no carbon or conducting metal in the ballast they can be depended upon to make a reliable lock, if properly cared for; but experience on different roads shows such varying results that it is desirable to carefully compare those results before using them as a basis for estimating the degree of security obtainable by a rail-circuit lock. There does not appear to be any remarkable degree of skill required to make an electro-magnet respond with certainty to the action of a rail circuit, but yet there seems to be some uncertainty in places where there are plenty of skillful men.

*Railroad Gazette, Dec. 5, 1890, page 813.

Derailments Caused by M. C. B. Couplers Pulling Out.

There has been considerable talk about vertical plane couplers pulling out and dropping on the track and causing wrecks. A well authenticated case happened on a road running out of Chicago on the 15th inst. A vertical plane coupler on the third car from the engine pulled out and dropped on the track. A part of the train ran over it; and as there was not room enough between the ties and the spring planks of the trucks for the head of the coupler, several of these planks were ripped out, and the cars were thrown off the track in two or three places. The train was running at about 25 miles an hour, and fortunately had 15 air braked cars in the 27 car train. This is the first case of the kind that has been known to happen on this road where there is a large number of vertical plane couplers in use. The reason for the pulling out of the coupler on this occasion was the breakage of the tail bolt.

There are several lessons to be drawn from this accident. The most important one is with regard to tail-bolts. The weakness of this attachment we have written of before, and it is now generally understood by railroad men who carefully watch the causes of failures of drawbar attachments, that the tail-bolt is an insecure device. It has been discarded by the Pennsylvania road, by the Burlington and by some other large roads that have tried it extensively. Some roads have never had any confidence in it and have never used it to any extent. The Committee on Couplers, appointed by the Master Car Builders' Association last year, was of the opinion that a tail-bolt should be discarded as unsafe.

Another lesson which may be drawn from this case is the value of the automatic air brake. If there had not been an automatic brake there would have been a serious wreck, as more of the train would have run over the displaced coupler and the entire stored energy in the train would have been expended in wrecking the cars that were derailed by the coupler. As it was the emergency brake acted instantly and stopped the train before any very serious damage was done. The use of air brakes on trains partially equipped is considered in another article.

Of course, what is most emphasized in this case of derailment is the certainty that damage will result if a vertical plane coupler is pulled out on the track, and the lesson is that couplers, particularly of the vertical plane type, should be as securely attached as possible to the bar. Of all known forms of attachment, the tail strap is considered by those who have the most experience the best and most secure, although giving a little more trouble in repairs than the tail bolt attachment.

Now there are many devices intended to supplement the drawbar attachment in preventing vertical plane couplers from falling on the track in case the tail attachment breaks, and a majority of these devices are intended to lift the locking pin and uncouple when the tail attachment gives out. But for the reason that the force required to lift the locking pin when the train is pulling out is great, particularly so if the locking pin is bent, and also as there are many cases where such devices are ineffectual because the cars are connected by links and pins to the end of of the knuckle, and, further, as these automatic unlocking devices are frequently ripped off and inoperative or are too weak to be effective, there is not much hope for security in this direction. Some other devices that are intended to catch against the sills of the car are placed too far back on the coupler, so that if the breakage of the shank should follow a breakage of the tail strap or precede it, there would be nothing to prevent the coupler head and a large portion of the shank from falling on the track and causing much damage. However, even if the first class of devices were strong enough, the mere lifting of the locking pin does not necessarily prevent the coupler getting on the track, because the slack in the lifting device might quite readily permit the coupler to get so far out before the lock was lifted, that it would thereafter rattle out and drop on the track.

In what precedes we have referred to apparently useful designs, but there are many devices intended as improvements on the original form of the vertical plane coupler, in the way of automatic opening devices, lock lifters, etc., that are seen from a cursory examination to be useless and without the slightest practical value, and it is questionable whether it is practical or advisable to put anything more than a lock lifter on any car with a vertical plane coupler. Lock lifters alone are hard enough to keep up, and anyone making an examination of cars in large terminal yards will become convinced that the prevailing lock lifting mechanism is entirely inadequate. All complicated and ill designed lock lifters are quickly broken and are practically out of use after the cars have been in service a few months. The simple top lift with an end attachment for keeping the pin in an unlocked position made with a plain wrought iron shaft and two bearings, with a chain connected to the coupler locking pin is apparently the most durable of all, but even this, in a large number of cases, will be found to be inoperative. Where it is inoperative, the trainmen lift the locking pin with their fingers, throw open the knuckle and allow the cars to couple automatically. If the Master Car Builders' Association would adopt a standard unlocking device for vertical plane couplers and make the device about twice as strong as those that are used at present and of the simplest possible form, there would be a decided decrease in the number of inoperative couplers found at interchange points.

So far as concerns the automatic unlocking mechanism for the purpose of preventing the coupler from falling on the track when the tail attachment breaks, its use is probably undesirable until some experiments have been made to show that it is effective. It is undesirable because it simply adds, as a rule, more mechanism to get out of order, and it has not been shown that it serves any useful purpose. The forces acting when a train breaks in two are altogether too great to be resisted by the addition of a small piece of ⅜ chain or a light rod or malleable iron lever, and this, we believe, describes the majority of the automatic unlocking attachments now advocated.

If all freight cars were equipped with strong safety coupling chains and these chains were used, there is no doubt that some of the most disastrous train wrecks—those from trains breaking apart—would be prevented and the use of such chains was advocated in a paper which was read at the last meeting of the New England Railroad Club by Superintendent McAlpine, of the Old Colony, and printed in the *Railroad Gazette* of Nov. 18. It will be readily agreed that Mr. McAlpine's point is a good one if it could be put into effect. The indiscriminate way in which freight cars are used, is, however, a difficulty which will be universally regarded as insur

mountable. Not all the roads can be induced to put on chains, and no road uses enough of its own cars by themselves to make it worth while to begin so radical a change. It is true that some roads run large numbers of their own coal cars, or, at least, their own and those of a few immediate neighbors, so constantly in one line of trade, that the cars might be kept together enough to pay for putting on chains and using them; but very likely we should find that the larger part of these failures of couplings are attributable to borrowed cars and to the weaknesses incident to making couplings between cars whose drawbars are not exactly alike. At any rate we all know that one of the most frequent explanations is that the link which broke came from a foreign road, or the drawbar which proved to be weak was on a foreign car. If any one does carry out Mr. McAlpine's suggestion, however, we take the liberty of speaking a word of caution about the strength of chains. We have said before, but it will bear repeating, that the great majority of safety chains now in use are so weak that they do more harm than good. A sufficiently strong chain must be made of iron at least 1⅛ in. in diameter, and this would mean an expense of probably $8 to $10 a car. Again, most superintendents would bring up an objection of a different kind after the chains were put on; they would complain of the difficulty of making trainmen couple them up in every case without exception. It is fair to assume, however, that a superintendent who realizes the importance of safety so clearly as to employ this special safeguard would sufficiently appreciate the value of good discipline to devise a way to make his trainmen obey orders. The foregoing contemplates only the present aspect of this problem, of course. With the continual enlargement of locomotives and the length of trains we may come to feel a need of safety chains even with vertical plane drawbars and air brakes; but that question can be postponed a while.

A correspondent sends particulars of a peculiar accident to a passenger train. Between A and B the train made five or six stops, in all of which the brake worked well. The last was within 10 miles of B. Entering the yard at B, the engineman found that the brakes would not work and reversed his engine and appears to have stopped without serious damage. On inspection it was found that the air brakes of all the cars were cut out by the closing of the valve at the forward end of the car next the tender, where was one of the old fashioned Westinghouse cocks with the handle turned down when the brakes are cut in. The accident occurred in broad daylight, and no one could have meddled with the train without being seen. An engineman who happened to be in the forward car says that he heard a thump on the bottom of the car, as it appeared, about three miles before the yard was reached. Immediately after the stop, he found that the cock was turned to cut off the air, and there was an indentation on the handle of the cock, showing that something had struck it. It was found also that the forward ash-pan bolt was out. Several such cases have been reported and have been carefully investigated by the Westinghouse people, and it has been found that sometimes trainmen had failed to open the cock; in other cases it had been closed by somebody, from curiosity or malice. One comparatively recent case happened in which tramps shut the cock while the train was in motion, to prevent the train being stopped. This resulted in a collision, which caused the death of a tramp, a good job so far. There have been, however, undoubted cases of the cock being turned by flying objects, such as ballast and coal. In the old style of cock the handle pointed directly down when the air was cut in. This arrangement was used because if the handle stood in the horizontal position with the cock open it might be shaken down to the vertical position and cut out the air. With this arrangement, sheet iron shields have been placed before the handle of the cock to prevent its being hit by flying objects. But the Westinghouse company considered this feature to be of so much importance that in getting out the quick action brake apparatus, the present form of angle cock was adopted, in which the handle turns in a horizontal instead of a vertical plane, and is so shaped as to conform to the outline of the cock and extend in the direction of the length of the car when the cock is open. This arrangement probably removes the possibility of such an accident as has been described.

Railroad officers and others who deplore the evils incident to the use of private refrigerator and cattle cars will be interested in the following announcement of a "New Refrigerator Express Line," which comes from Topeka. It says: "The Western Meat & Refrigerator Express Co., has filed articles of incorporation with the Secretary of State. The company will have a capital stock of $500,000, and will have headquarters in Kansas City, Omaha, Dubuque, Green Bay, Des Moines and St. Joseph. The business of the concern is to build and operate railroad cars for the transportation of meats and provide suitable terminals and distributing depots for properly caring for them. The company is an auxiliary to the Northwestern Dispatch Fast Freight Co., which is the new name of the Eureka Transportation Co. This company is being reorganized to make it come under the head of railroad companies as defined by the Interstate Commerce Law, in order to prevent discrimination on the part of railroads which do not want to handle the Eureka Transportation Co.'s private leased cars." Quite likely this item may be partly composed of "gas," for a company does not "come under the head of railroad companies" merely by owning a lot of freight cars: but the instance is a reminder that a piece of track does not have to be very long to be a basis for a "railroad company," and that any agreement between railroads, looking to the exclusion of private cars from the freight business of the country, can be easily evaded by any railroad officer who may be so disposed. The Illinois Steel Co., with its half dozen small railroads, is an example of what may be done in this respect.

An important step in the investigation of the conduct of the affairs of the Panama Canal was taken in Paris last Tuesday. M. Delahaye moved in the Chamber of Deputies an inquiry into the affairs of the company, and after considerable debate the motion was carried unanimously—probably no one dared vote against it. The debate, such as it was, was a stormy and dramatic episode. The greatest confusion prevailed, and at least one duel began and proceeded so far as the appointment of seconds. M. Delahaye said that the inquiry was a matter of public morality, and besought the Chamber to make it for the sake of his own honor and that of the deputies. He made charges of wholesale bribery of deputies, and said that when the proposition for the issue of lottery bonds was made, an individual, whom he did not name, asked from the Canal company 5,000,000 francs with which he said he could purchase "all the necessary consciences in both chambers." The sum of 3,000,000 francs was distributed among 150 deputies and a few senators, but the appetite grew in eating, and the enterprising lobbyist asked for more money. Three million francs was spent in buying three newspapers. A minister, now dead, asked 400,000, and a foreign journal was bought for 500,000 francs. One Deputy who held the balance in the committee before which the lottery bond scheme was brought, asked 200,000 francs, and appears to have succeeded in squeezing it out of the Company. M. Delahaye said that there were "two classes of deputies, those who received money, and those who did not." Those opposed to the motion asserted that it arose from political motives. To add to the sensation of the hour Baron Reinach, who is supposed to be the "evil genius of the company," mentioned by M. Delahaye, has died suddenly under circumstances that suggest suicide, and it is even suspected by some that he was murdered. He seems to have been the chief of the lobbyists and press agents in carrying on the nefarious business. Summonses have been issued to M. de Lesseps and the other defendants, charging them with fraud and swindling. M. de Lesseps is reported to be seriously ill, and considering his extreme age it is quite probable that he will not live through the investigation.

NEW PUBLICATIONS.

The Civil Engineer's Pocket Book. By John C. Trautwine, C. E. Revised by John C. Trautwine, Jr., C. E. New York: John Wiley & Sons. 1892. Price, $5.

The 16th edition (41st thousand) of this invaluable book is just out. Most engineers are familiar with the steady improvement that has been made since the manufacture of the book passed under the control of the younger Mr. Trautwine, which was before the appearance of the ninth edition. This improvement has been made in the quality of the paper, in press work, in the clearness of the illustrations, in typographical arrangement and in recasting old rules and setting new ones in the shape of formulæ, which shape, after all, is much more convenient for most readers than that which the author of the book chose. In the succeeding editions new articles were introduced or old ones rewritten, and it is not necessary to particularize as to those changes. In the 16th edition among the new features are a table of reciprocals; tables of heads and pressures of water and of discharges in cubic feet per seconds and in gallons per day. The table of weights of water in 1 ft. length of pipe of different diameters has been extended and set in larger type, and coefficients for the conversion of heads into pressures and *vice versa* have been placed in convenient form with their logarithms. The results of Bazin's experiments with inclined weirs have been introduced, as have also new tables of Carnegie's columns and beams. A number of minor changes have also been made. On the whole, one must admire, and be thankful for, the constant intelligence and industry with which this work is kept up to date.

97.3 Miles an Hour on the Central of New Jersey.

On Friday, Nov. 18, engine 385 of the Central of New Jersey, the Vauclain 4-cylinder compound which several months ago made a record of 91 miles an hour, traveled a mile in 37 seconds, and two consecutive miles in 75 seconds, thus beating its own record as well as all others. This was done with a regular train of four cars, going east, between Fanwood, N. J., and Westfield, the grade being 32 ft. per mile, descending. On the same trip a distance of five miles was traversed in 3 minutes, 25 seconds, thus making the best record for that distance (87.8 miles an hour). This was between Somerton and Parkland, Pa., on the Reading, which is the same portion of the road where so much fast running has been done heretofore. The grade here is partly descending at 11 and at 37 ft. per mile, and partly level. A profile of this part of the road was printed in the *Railroad Gazette* of Sept. 14, 1891. This engine, No. 385, was described in the *Railroad Gazette* of Feb. 12, 1892. It has four 78-in. driving wheels, weighs 62 tons, with 44½ tons on the drivers. The time was taken by a reporter of the Philadelphia *Public Ledger* who was on the engine, and is vouched for by Mr. Vauclain, who was also in the cab. The following particulars are given in the *Public Ledger's* account:

The Central has five of these engines. They were built at the Baldwin Locomotive Works and are the invention of Mr. S. M. Vauclain, Superintendent of the works. An exact counterpart, No. 1,510, is running two-hour trains between New York and Philadelphia [on the Pennsylvania]. There was no preparation whatever made for the test. The rain poured in torrents, and only ceased half an hour before the time of leaving Ninth and Green streets, which was at 5:15 p. m. The train was made up of a combination car, two day coaches and a Pullman car.

The engineer was Henry Beck, who has been running fast express trains for 10 years, and who made the record with 385, and the fireman David Blake. Road Foreman of Engines John Hogan was on the train. The indicator showed 180 pounds boiler pressure. Between Tabor and Jenkintown the grade is for a short distance up hill 78 ft. to the mile, but the speed was terrific, five miles of the distance being covered in four minutes.

Between Somerton and Parkland, a distance of five miles, the longest time for a mile was 42 seconds, the first mile being run in 42, the second in 41, the two following miles in 40, and the last in 42 seconds. The speed was remarkable, and was between 86 and 90 miles an hour. The five miles were made in 205 seconds, which broke all records for a five mile run.

After passing Neshaminy all previous records were broken, and 385 reduced her own unsurpassed run of 39¼ seconds for a mile to 39 seconds. Plainfield was reached 3 minutes late. The mile post was just beyond, and the chronograph in the grasp of the reporter snapped as the pressure was applied, and the long, split-second hand started around the dial. To describe the speed is impossible. There was the sensation of being whirled through space, and nothing but the roar of the wind and the train as it sped on. It was this mile that was covered in less time than was ever traveled in, and when the next mile post shot by the time on the dial was 37 seconds. The train flew on with unabated speed and the chronograph was snapped as the next mile post was passed. The time for the two miles was exactly 75 seconds. This made the greatest record for one and two miles, as the performance between Jenkintown and Langhorne did for five miles. . . . The rest of the run was uneventful.

The First Casting Made in America.

Last Monday evening an iron kettle, which is claimed to be the first iron casting ever made in America, was presented to the city of Lynn, Mass., by certain citizens. Part of the presentation ceremony was an address by Mr. C. J. H. Woodbury, Vice-President of the Boston Manufacturers' Mutual Fire Insurance Co. The whole address is very interesting, but we can only give extracts from it here. Mr. Woodbury said:

A few months ago I learned that Messrs. Arthur and Llewellyn Lewis, the owners of the kettle well known as being the first casting made at the Saugus Iron Works, were seriously considering the acceptance of one of several offers recently made for its purchase; and as it appeared to me that this article, which was the precursor of the vast iron industry in America, should be kept at Lynn, where it properly belonged, as a relic most closely affiliated with the early history of our town, I at once purchased the kettle. Some of the citizens to whom the facts were submitted at a later day joined in the expenses involved in the purchase and mounting of the kettle in a suitable case for its presentation to the city; but before the whole affair was consummated, John E. Hudson, Esq., now a resident of Boston, but born in Lynn, and for many years a resident of this city, claimed the privilege of making the gift to his birthplace. His interest in the matter was a deep one, as he is a direct descendant of Thomas Hudson, the owner of the site upon which the Saugus Iron Works were built, and his request was conceded by the original subscribers, who now offer the case in which the kettle is placed for safe preservation.

The kettle is an example of the state of the art of iron founding in 1642. . . . The tablet bears the following inscription:

The first casting made in America. Saugus Iron Works. 1642. Presented to the city of Lynn by John E. Hudson, a descendant of Thomas Hudson, the owner of the site of the iron works, to whom the first casting was given. This case presented by citizens of Lynn, 1892.

The design of the kettle is that of a type used in the earliest colonial days, but in its physical characteristics it bears evidence of being made of iron cast directly from the ore as reduced in a blast furnace, and not from pig iron remelted in a reverbatory or a cupola furnace; and there is no reason to believe that there was either of these furnaces at the Saugus Iron Works. Thomas Hudson owned sixty acres of land on the westerly bank of the Saugus River, and he sold this land to the Company of Undertakers for the Iron Works. He claimed in consideration the first article made at the works, and this kettle was kept by him and his descendants in the male line for over a century, when it passed in the fourth generation to Mary (Hudson) Lewis, who gave it to her daughter, Mary Lewis, and she in turn gave it to her nephews, Arthur and Llewellyn Lewis, from whom the purchase was made.

The Saugus Iron Works were such an important factor in the inception and early development of American industries that their early history merits due consideration. This was not the first attempt at iron smelting, but the first success. . . . The bog iron deposits in the upper Saugus meadows were discovered by Thomas Dexter, one of the colonists, and he informed his fellow townsman, Captain Robert Bridges, who went to London and formed the Company of the Undertakers for the iron works, which was started under the management of these two men, with Joseph Jenks, one of the best workmen of the day, as master mechanic. . . . The site of the iron works was well selected, being situated at the head of navigation, by the ford in the highway from Boston to Salem, at a water power, and near to the bog iron ore deposits, whose exact location is unknown, save that they were in Adam Hawkes' meadows. The whole iron works

tract probably covered three thousand acres. The General Court granted them at various times immunity from import or export duties, and from taxation, and other privileges. I believe that the act of Oct. 14, 1645, is the earliest instance of legislation upon the principles of protection to manufacturers, which has been such an important feature in the development of American industries.

There is not any detailed description of the works and the exact methods employed. . . . The works contained a blast furnace, in which bog iron ore was reduced by means of charcoal, using as a flux lime, which in the earliest days of the works was obtained from the oyster shells, which then abounded on the coast of Massachusetts Bay. Cannon were also melted at this foundry, far in advance of the time when swords were to be beaten into plough-shares, or spears into pruning-hooks. The iron from the blast furnace was run into straight trenches in the sand, and thereby cast into long triangular bars called "sow iron," which were converted into wrought iron and steel. Castings were made directly from the metal flowing from the blast furnace into a pool, whence it was dipped by crucibles and poured into the molds. The cupola furnace was not invented until 1790.

The manufacture of wrought iron and steel must have been entered upon contemporaneously with that of cast iron. . . . The wrought iron and steel were made in a blomary, which may be described as a charcoal fire 4 ft. thick in a blacksmith's forge. The end of a bar of sow iron was plunged into the fire, and in time a pasty mass of wrought iron would settle to the bottom. Other portions of the bar would be converted into steel when the process stopped at the intermediary stage between cast and wrought iron. This process of steel making is still used throughout the oriental nations, and also in the mountainous region south of the Ohio River. The iron works also included a machine shop, in which the first fire engines made in America were built, for the Town of Boston.

The litigation to which the iron works were subjected increased and became oppressive. It appears as if the impulse to "sue the corporation" was instinctive among the townspeople. The corporation, its managers, and its workmen were proceeded against under every conceivable excuse. The boundaries of worthless land, poor crops on sterile soil, unrestrained courtships, speaking lightly of the Governor, reproachfully of the Church and harshly of the King, were all subjects of long continued and bitter litigation. Land was sold to the corporation and afterward further damages claimed. Dexter brought suit because the alewives did not come into his net below the dam as of yore; and Hawkes sued because the latter rose too high above the dam. The town sued the corporation for pew rents in a meeting-house several miles distant, and notwithstanding the immunity in the act of Oct. 14, 1645, already quoted in part, won the case. The pews could could not have been worn much, for the courts took action against the managers for not attending the public worship.

The works are not known to have been in operation after 1688, when the tract had diminished to 600 acres and passed into individual ownership. If the supply of bog iron ore had been sufficient for the works, they would undoubtedly have been continued the same as other enterprises of that day in various parts of New England.

The immediate return to those engaged in the enterprise is now of little moment, but the results to the whole Colony of an establishment which attracted, developed and then scattered a body of skilled mechanics were of great importance and no doubt may have been an essential factor in rearing many prominent industries.

Convention of the Roadmasters' Association of America.

(*Concluded from page 879.*)

The discussion on the rail joint report was opened by Mr. Ward of the South Carolina Railroad, who, discarding the form of joint, confined his attention to discussing the holes that should be put in angle bars. His ideas were that there should be oblong holes in the inside bar to catch the bolt and keep it from turning, while the outside plate should have round holes fitting tolerably close to the bolt. The advantages gained are that the bolt is held from turning and there is a smooth round, full bearing for the nut-lock which would not be the case were the holes oblong. Whereas the claim that expansion can be allowed for where oblong holes are used, is erroneous.

This was followed by the report on

FASTENING RAILS TO THE TIES.

The committee considers itself confined to spikes and bolts, with a right to suggest any other appliance which will aid them in bringing about good results and economy in use of same. As regards the use of bolts, we have had considerable experience with the Bush interlocking bolts, and consider them a success so far as holding rails in position is concerned, but cannot recommend them for general use because it requires so much time to get them in position in track, and also the extra cost over the ordinary track spikes. We have also had considerable experience with tie-plates, and appreciate the assistance they render to spikes in performing their duties; and in conclusion would recommend the use of the Bush interlocking bolts, or some other bolt similar, on bridges and trestles, and for all other track a steel spike of the most approved pattern of the best of material, set in proper position and driven in a proper manner, assisted by a steel tie-plate on all soft-wood ties and on all ties and curves. George W. Bishop, Chairman; Frank C. Clark, Joseph Kindelan, G. H. Prentice.

Then came the report on

SWITCH STANDS.

We recommend that an automatic switch stand should be used; so constructed that if the switch is set for the train passing over it *trailing*, the pressure of the wheels against the switch points will throw the switch to proper position for the train passing through it, and at the same time turn the target to indicate the position to which the switch has been forced. For switches leading out of main track, switch stands with target not less than eight feet in hight should be used. For yard stands would recommend automatic ground stands, or, at least, no higher than 2 ft. 2 in. above head block, which would make it about 3 ft. 2 in. high above the rail at night when switch lamp is being used.

We favor double targets.

As the danger in split switches lies in running against the points, switch stands should be set on the right-hand side when facing the point of switch, not less than six feet from the stand to nearest track rail. If more than one switch leads from the main track at one end of the yard or station, the stands should either vary in height, placing the lowest stand first at the extreme end of yard, and so on consecutively; or the distance from track of each switch stand be varied, or both; so as to be able to get a clear and distinct view of each switch target leading from the main track. J. B. Moll, Chairman; I. Burnett, G. E. Cain, John Sloan, I. O. Walker.

DISCUSSION.

Mr. WALKER opened by giving his opinion of an ideal switch stand. It should be one that, if it were set for a siding, would allow a main line train to trail through and set for the main line, but, were it set for the main line, would allow a train to trail through from a siding and still remain set for the main line. Any automatic switch stand can be made to operate in this way if the clutch is made in the one face of its dogs square and the other on a level. Another objection to having an automatic stand so made that a train from a siding can trail through and have it open from the main line, is that anyone can throw such a switch with a bar. As to the proper location of the switch stand it should be on the right-hand side of track on the approaching side of a facing point. There can never be any danger of car obstructing the view from the opposite direction, as there is eight feet between tracks and the longest bar is only 7 ft. in length.

As for absolutely preventing maliciously disposed individuals from turning switches that is an impossibility, for a heavy stone will serve to break a lock, so that that objection to automatic switches vanishes, and it seems desirable that they should be used everywhere; but, in order to stop the practice of trailing through, the crews doing it, should be suspended.

MR. ROBERT BLACK approved of the automatic switch, and stated that he had switches in use that were always trailed through and never thrown, and he had never had any trouble with broken joints.

Mr. JONES had had an experience with the rigid switch which meant the putting in of new points on an avervge of once every three months, but when a Ramapo automatic was submitted two and a half years ago, the trouble ceased at once, and though the switch has been in constant use during the whole of that time there have been no repairs.

Mr. MOLL has a Ramapo stand in one place where it is never thrown and where all engines trail through it. It has been in use for two years and has not even a target upon it. However, where a switch stand can receive the proper care and attention an automatic stand should be used, but in other places a rigid is decidedly preferable. The reason for this is that the main danger is in running against switches; hence rigid stands should be used in facing points.

Mr. SHARP had experimented some with the Ramapo switches, and found that they were thrown by the pressure of the wheel flange after a very slight motion had been imparted to them. But as to the advisability of using automatic switches to prevent breakage of rigid points by carelessness of train crews, it does not seem that this is the proper place to debate train service, and so that side of the question should not be considered. However, Mr. Burgwin is undoubtedly right, and the automatic stands should be used in all places.

Mr. COLLINS stated that for seven or eight years the Old Colony had used automatic switches on main line, sidings and in yards. The Ramapo was the principal type, though the Bryant was used where engines went in one way and out by another, as in coal sheds and train houses. No trouble of any kind is experienced from their use in all trailing switches. Of course, where an interlocking system is used the switch becomes practically rigid.

On reaching the subject of lights and targets, Mr. HAWKINS wanted white for the main line and red for sidings, both in target, and light colors.

MR. WALKER agreed, but thought the targets of a very different form and color should be used for the two positions of the switch; and just as there is one color for clear and one for danger so the positions should vary. By inquiring as to the prevalence of single or double targets for switch stands the Weir Frog Co. reported that 90 per cent. of the railroads use double targets; the Union Switch & Signal Co. make the same report; the Elliott Co. says that about one-third use single, one-third double, and one-third vary between the two; the Pennsylvania Steel Co. report one-quarter of one per cent. as using single stands; the Ramapo Iron Works say that their orders are about equal for double or single.

MR. MOLL disapproves of the use of double targets and said that the New York Central was going back to the use of the single. There is no need of showing anything when the track is clear, and a great mass of white lights in a yard is apt to confuse the eye and so distract the engineer that he will fail to see a red light.

MR. DAVIS said that the principal advantage of the double light was to show at all times whether the lamp was burning or not, otherwise the white light might be dispensed with.

MR. REED called attention to the standard code of rules which makes a white light the signal of safety and red, or no light at all, one of danger. Therefore, any road operated according to the code must have its signals work in this way.

MR. BLACK asked about green for sidings, and said his signals were: white, all clear for main line; red, danger; green, all clear for siding.

MR. STEARNS, of the C. & N. W. Railway, uses red and green; the first for danger, and the second for safety, while a round, 10 in. red ball indicates a main line clear by day.

This discussion was followed by a report on a code of rules to govern trackmen, by Messrs. Reed, Burgwin, Stearns and Doyle. It was very long and is held for future consideration.

REPORT ON WORK TRAINS AND THEIR HANDLING BY DISPATCHERS.

Cause of delay in a majority of cases will come under the following heads:

1. Lack of mutual understanding and information between work train conductors and dispatchers as to location of work and time likely to be consumed between given points. There should be a thorough interchange of information.

As far as practicable conductor should give dispatcher reliable information as to location of his work, probable time to be consumed and which direction he expects to move after finishing work at that point. Dispatcher, on his part, should keep work trains thoroughly posted as to expected movements of trains affecting them. Much of this would, of course, be given in the train order, but there are often pointers which could be given work trains that would be helpful, not ordinarily or properly included in a train order.

A work train usually is out of dispatcher's reach a greater portion of the day, and is frequently tied up by signals being put on regular trains to enable dispatcher to safely move trains which would otherwise be run extra and work trains given a better showing against them. If work train conductors were advised of any anticipated extras which had not been definitely decided upon, they could frequently arrange their work so as to report at a telegraph station in time for orders. This is but one of the many contingencies that arise in practical every day railroading which could be helped by mutual information.

2. Taking too long limits by work trains. Work trains should be cut down to the shortest possible limits, as a dispatcher can give them a much better showing with a short limit than on a long one, particularly as against extra trains. Limits can be changed or extended with but little delay or trouble—especially if dispatcher has been previously advised as to expected movement of train.

3. Apparent indifference on part of both conductors and dispatchers. Conductors are apt to feel and show their independence by indifference in their dealings with the transportation department, and dispatchers on their part get to feel that work train service is a matter of secondary importance as compared with trains directly controlled by that department, and if trains are late, do not always take the trouble to hunt up work trains and try to help them. Work trains, on their part, will run by telegraph station and go to blind sidings to meet expected trains without making the least effort to find out how trains are or advising dispatcher as to their own whereabouts, feeling that delay will be chargeable to the dispatcher whom they are often only too glad to see blamed. The only remedy for this is to hold dispatchers to a more strict accountability—for delays to work trains, and to have work trains stop at telegraph stations when working on limits and ascertain if dispatcher can assist in any way. The system of allowing work trains to work under flag against freight trains is a good one under some circumstances, but where track is crooked and traffic heavy, we do not think it advisable.

4. A spirit of retaliation on part of both work train conductors and dispatchers. This is another evil which should not but does exist. A conductor will give a dispatcher incorrect information as to time he will make a certain point, causing dispatcher to unnecessarily delay some other train. Next time dispatcher gives the other train preference, and work train suffers, and conductor will retaliate on his part at first opportunity, and so it goes on.

The remedy lies, as before stated, in more accurate information and a more strict accountability. You cannot change human nature by rule, but you can tone it down by discipline. J. W. Craig, Chairman; C. C. Mallard, P. Nolan, J. F. Shea, John Doyle.

After the reading of this report Mr. Craig stated that that was based upon, and was, indeed, an almost verbatim copy of a letter from Mr. Hinsdale, dispatcher of the South Carolina Railway, to whom the credit for the report is really due.

THURSDAY MORNING.

The meeting was called to order at 9 A. M., with President Doyle in the chair, and the first business was the reading of the report on block signalling, by Mr. H. W. Reed. This also was very long, and while it is instructive and valuable would not be new to the readers of the *Railroad Gazette*.

The Secretary then read the following letter based upon a resolution passed at the Minneapolis meeting in 1891, requesting members to bring samples of treated ties for inspection; the one referred to in the communication being on exhibition in the Supply Hall.

The tie was taken from the track of the Atchinson, Topeka & Santa Fe Railroad near Las Vegas, New Mexico, presented by J. M. Meade, member of the Association, Topeka, Kan. This tie was treated and put in the track in July 1885, and has, therefore, been in use seven years. It was put in adobe soil about two miles east of Las Vegas, and was one of the first ties treated on the Santa Fe system by the Wellhouse-zinc process. We then used chloride of zinc, glue and tannin. Mr. Charles Dyer, our Superintendent at Las Vegas, has kindly furnished me considerable information with reference to this work. We are, therefore, dealing with actual facts in presenting this specimen and the information given.

He informs me that after the timber has been seasoned from five to six months, it is then run into long iron cylinders; the doors are closed and fastened and the timbers heated from two to three hours to get out the natural sap. The longer the timber, the longer it is left in the cylinders. Short ties are steamed in from about two to three hours, then the condensation is drawn off, and a vacuum pump is put on to secure as much of a vacuum as possible, then the chloride of zinc is let in. After taking up all the vacuum it will, a pressure pump is then put on and the pressure forced up to about 100

lbs. to the square inch, leaving the pressure on about two hours. What solution is not taken up by the wood is then pumped back into the vats, and the glue and the tannin put in afterwards.

Mr. Dyer informs me that at present we are only using the Burnettizing process, consisting simply of chloride of zinc. We have only been using this latter process for the past two years, and we cannot say what the results will be. My private opinion, however, is that the use of the glue and tannin with the chloride of zinc is very beneficial, as it prevents the rain and dampness leaching out the chloride. The glue and tannin seal the ends of the ties, and keeps the solution in the grain of the wood, as we find that all solution is gotten into the wood lengthwise with the grain, and not from the sides. We believe that the treating of the ties will at least double the life of them.

The actual cost of treating a standard tie 8 ft. long with a 7-in. face and 8in. thick by the Wellhouse zinc processs has been from 14 to 16 cents, varying according to the price of the chemicals. This price includes the labor of handling in and out of the works and spotting the ties, that is, sawing them all to a uniform length with revolving knives to cut a dap and seat for the rail base inclining the rail toward the inside of the track. By the Burnettizing process the cost has been about 12 cents.

In New Mexico we found that our ties last longer in adobe soil and red clay soil than in the sandy soil. The volcanic sand in some portions of the Rio Grande Valley rot out ties very quickly. Mr. Dyer informs me that the native mountain pine ties when put in untreated rot out in from two and one-half to three years, and treated ties that have been in the soil for the past six or seven years are still apparently in a very sound condition.

From these tests it would indicate that the treating of ties in the section of country mentioned has nearly trebled their life. J. M. MEADE.

Then followed the report of the Committee on

THE NUMBER OF MEN IN RELAYING STEEL AND ORGANIZATION OF THE WORK.

Owing to the absence of the chairman of the committee and their failure to report, a communication to the chairman by a member of the committee was offered in its stead. The communication was as follows:

The method to be followed in relaying steel rail and the force required to relay it speedily and economically will depend largely upon the alignment, the condition of the cross ties, the number of trains using the track and the hours during which the traffic is the heaviest. On the division upon which I am employed we pull the spike and throw out the old rails in a string, or without being uncoupled at the joints; adze the ties well and to a good even bearing before laying down the new rails, which are placed in one at a time, carrying them to position with rail tongs; use an expansion shim or grasshopper, having four legs of varying thickness to permit a more accurate adjustment for changing temperature. Adjust the angle bars and bolt all the new rails together as rapidly as they are dropped into place; full spike the rail and spike into the slot of the angle bars at every joint where it can be done.

Our flagmen stay out all day, unless recalled, with instructions to flag all trains. Just before passenger trains are due and after freight and extra trains get within hearing, we close the tracks, using a split switch point, placing the heel of the point rail against the last new rail laid. If in closing up for the night we stop on a tangent or on the low side of a curve, we close with the switch point. If we close on the high side of a curve, we cut a rail. The point rail is carried on a push car, and is kept just ahead of the rail being thrown out of the track and is then always at hand to use in closing.

In relaying steel rail this year we used a force of 47 men, distributed as follows: 2 flagmen, 6 driving spikes, 3 throwing out old rails, 5 adzing ties, 8 carrying rails with tongs, 1 adjusting expansion shims, 1 holding rail against spikes with bar, 6 spiking, 1 drawing spikes for new joints, 12 putting on six-bolt angle bars, 1 adzing ties for new joints.

Upon the piece of track where the work was done, the curves, ranging from one to five degrees are almost continuous, and over it moved a traffic of 83 trains daily, crowded pretty close together in the morning and late afternoon.

The ties being deeply cut into by the old rail, the labor of drawing the spikes and adzing was much increased, no spikes having been started or drawn before relaying. A rail of heavier pattern was used in relaying and the gauge was drawn in one-half inch, necessitating the pulling of all the spikes on the inside of the rail, and requiring one additional man. In throwing out the rails with this force we averaged about one mile of track per day complete on both rails, and were not charged with the detention of any passenger trains. No freight trains were held over ten minutes.

The election of officers resulted in the election of the following: *President*, H. W. Reed; *1st Vice-President*, W. H. Stearns; *2d VicePresident*, J. B. Moll; *Secretary and Treasurer*, J. H. K. Burgwin; *Member of Executive Committee for three years*, Robert Black. Chicago was selected as the meeting place of the next convention. Immediately after the passage of appropriate resolutions the convention was adjourned.

EXHIBITS.

American Nut Lock Co., St. Louis, Mo., nut locks.
American Washer & Manufacturing Co., Newark, N. J., nut locks.
Boston Tool Co., 178 Devonshire street, Boston, Mass., drag-saw and rail cutter.
Buda Foundry & Manufacturing Co., Harvey, Ill., steel hand-car wheel.
Contipuous Rail Joint Company of America, Newark, N. J., continuous rail joints.
Diamond State Iron Co., Wilmington, Del., standard combination tie-plate and brace; excelsior nut locks and fish-plate springs.
Dilworth, Porter & Co., Pittsburgh, Pa., goldie tie-plate; Goldie spike; Goldie perfect tie-plug.
Elliott Frog & Switch Co., East St. Louis, Ill., Blue prints of improved spring rail frog, automatic diamond passing rwitch, switch stands, lap switch and crossings.
Fairbanks, Morse & Co., Chicago, Ill., Shorthill cattle guard, model of hand car, Barrett's lifting jacks, hand car wheel.
Gilbert, J. N. C., 115 Broadway, New York, the Johnson rail joint, full size and model.
Hall Signal Co. New York, working model of electric block signal with cars, track and siding, full size signal, track instruments and crossing signal.
Heath Rail Joint Co., Minneapolis, Minn., Heath rail joint.
International Steel Post Co., Chamber of Commerce Building, Chicago, Ill., Steel fence posts; Australian wire stretcher.
Joyce, Cridland & Co., Dayton, O., jacks.
Lehmer, Joseph R., Omaha, Neb., Waterman track drill.
Manning, Maxwell & Moore, 113 Liberty street, New York, Smith rail saw, Fox pressed steel truck.
McConway, Torley & Co., Pittsburgh, Pa., continuous rail joint.
McMullen Woven Wire Fence Co., Chicago, Ill., woven wire fencing.
Merrill-Stevens Manufacturing Co., Niles, Mich., Merrill's steel stock guard.
Merriman, F. P., Charleston, S. C., model of frog and rail spikes.
Metcalf, Paul & Co., Pittsburgh, Pa., book of blue prints of hammer heads, rail joints, etc., nut locks.
National Lock Washer Co., Newark, N. J., nut locks.
National Surface Guard Co., Chicago, Ill., stock guard.
Niles Truss Rail Joint Co., 11 South Canal street, Chicago, Ill., Niles super-truss rail joint.
Positive Lock Washer Co., Newark, N. J., nut locks.
Price Railway Appliance Co., Philadelphia, Pa., rail joints, model of metallic tie.
Q. & C. Co., Chicago, Ill., Servis tie plate, Bryant rail saw, rail jack.
Ramapo Iron Works, Hilburn, N. Y., automatic switch stand, ground lever, blue prints and photographs of tracks, frogs, sidings and cross-overs.
Reading Bolt & Nut Works, J. H. Sternbergh & Sons, Reading, Pa., track bolts and nuts and spikes.
Roberts, Throp & Co., Three Rivers, Mich., hand car, quick service car, combination hand and push car.
Rodger Ballast Car Co., 1215 Monadnock Building, Chicago, Ill., model of track and ballast car, blue prints.
Shoulder Tie Plate Co., Philadelphia, Pa., shoulder tie plate.
Standard Cattle Guard Co., Chicago, Ill., stock guard.
Thacher Car & Construction Co., New York, two pneumatic dumping cars in operation.
Truss Rail Joint Co., Chicago, Ill., rail joint.
Weir Frog Co., Cincinnati, O., rail braces, blue prints of split switch, book of photographs of crossings, frogs, switches and switch stands.
Young Lock Nut Co., 150 Broadway, New York, reversible nut lock.
Warren & Hoke, Yorkville, S. C., combination switch lock and stand.

TECHNICAL.

Manufacturing and Business.

The Directors of the Barney & Smith Mfg. Co., have declared the regular two per cent. quarterly dividend on the preferred stock payable Dec. 1.

The Brewer Car Axle-Box Co., of Chicago, capital stock, $5,000,000; incorporators, Russell Brewer, C. P. Burdick, and A. G. Thompson, and the Hollenback Frog & Switch Co., of Chicago, capital stock, $100,000; incorporators, Wesley Hollenback, Thomas H. Brown, and R. R Bemis, filed charters in Illinois last week.

Iron and Steel.

An addition, 50 × 50 ft. is being built to the works of the Chester Steel Casting Co. at Lamokin, Pa., and will be used for the open-hearth department which is about to be added.

New Stations and Shops.

The Brownell Car Company, of St. Louis, proposes to build a car shop, 60 × 170 ft., on the east side of Broadway, near North Market street, St. Louis, to cost $60,000.

The Portland Terminal Co.'s new 20-stall round house, at the south end of the yards, at Portland, Or., is completed, and will soon be in use.

Ground has been broken for the works of the Niagara Car Wheel Co., at East Buffalo. John H. Fleming has been made superintendent.

The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for a new machine shop to be built at Newport News, Va., for E. C. Hillyer & Co. The building will be 82 ft. in width, divided into a central portion 40 ft. between crane girder columns, with a wing on each side 21 ft. in width. The wings will be two stories high the balcony floor being used for light work. The central portion of the building will be controlled by a 20-ton traveling crane.

Replacing an Anchor Bar.

It was discovered a short time ago that one of the anchor bars of the smaller suspension bridge at Niagara Falls was broken. This is the foot bridge near the falls. Mr. G. W. McNulty, the engineer of the bridge company, was called on to replace the broken bar. He discovered that the fracture was due to burning the steel. The problem of getting in a new bar and getting proper tension on it was a rather delicate one. The pit was opened up and the old bar taken out, and the new one was put in with a strap to go around the pin, which was secured to the bar by taper bolts. A trough lined with asbestos was put underneath the bar and a light fire kindled in it. This caused the bar to elongate sufficiently to easily take in the upper pin and when this degree of elongation was secured the head of the bar was put in place and secured by the strap and taper bolts.

Notes at Altoona.

The new Pennsylvania compound locomotive No. 1,515 is in the shops at Altoona for some slight change in the valves. We have already published the dimensions of this locomotive, namely: Cylinders, 19½ and 31 in. diameter by 28 in. stroke; drivers 7 ft. diameter; boiler, 60 in. diameter; boiler pressure, 200 lbs.; weight on drivers, 90,000 lbs., about. This is an 8-wheel engine and has been very carefully designed with regard not only to efficiency but to appearance, and if it proves to be a capable and economical machine it will doubtless establish a class. In appearance it is the handsomest of the recent passenger engines. Great pains have been taken to get harmonious lines and to give the engine and tender what artists call "composition." By careful arrangement of details the whole engine has the outward appearance of simplicity, so characteristic of English locomotive work.

At the Altoona shops there are building several heavy cars for the transportation of the Krupp World's Fair exhibit. There will be something like 1,000 tons of this material to be carried from Sparrow's Point to Chicago. One item is a gun weighing 270,000 lbs. This will be carried on two cars connected by a bridge. Each car will have two 8-wheel trucks, and in the middle of each car will be a pivot on which the ends of the bridge will rest. The whole construction is in iron. For a smaller gun, weighing 62½ tons, a similar arrangement is being made except that such cars will have two 6-wheel trucks instead of 8-wheel. Another car for which drawings have been made, is designed to carry a 65-ton armor plate. All of these cars will be used later for carrying armor plate and guns for the United States army and navy.

THE SCRAP HEAP.

Notes.

The man who pretended to save a Pennsylvania train from disaster at Enon, Pa., a few months ago, but who was found to have placed the alleged obstruction on the track himself in order to secure a reward, has been sentenced to 4½ years' imprisonment and $500 fine.

Ten ticket sellers of the Brooklyn Elevated have been discharged lately for embezzlement. It appears that they connived with the ticket takers, who, when there was a rush of passengers, kept back some of the tickets received instead of having them put at once into the cancelling box, according to the regulations.

The locomotive runners on three of the "dummy" railroads at Birmingham, Ala., struck on Nov. 15 against a reduction of wages, of which the company had given them 90 days' notice, according to agreement. It appears that they accepted the company's terms within two or three days, and business was resumed.

The Homestead Strike.

The strike at the Homestead Mills of the Carnegie Steel Co., was formally declared off on Nov. 20 by the Amalgamated Association. The strike has lasted 20 weeks. Most of the men were taken back by the company and given their old positions. This contest was brought on by a demand for a reduction of wages of about 33⅓ per cent. on certain classes of work in the open hearth departments, Nos. 1 and 2 mills, and in the 119-inch and 32-inch plate mills. This reduction directly affected only about 325 out of the 3,800 men in the works, but the others took up the matter as a common cause. The wages scale, expired July 1 and the company wanted the time of expiration changed to Jan. 1, which the men refused to agree to. On June 30 the company locked out all the men before they had the opportunity to strike.

LOCOMOTIVE BUILDING.

The Huntingdon & Broad Top Mountain railroad has recently ordered two heavy freight engines, and will soon order two passenger locomotives.

The 10 locomotives for which the Lake Shore & Michigan Southern has just contracted with the Brooks Locomotive Works are all 10-wheel passenger engines.

The Buffalo, Rochester & Pittsburgh has now received eight new locomotives from the Brooks Works, six of them for freight service and two for passenger service. Ten engines were ordered.

The recent report that the Baltimore & Ohio had contracted with the Baldwin Locomotive Works for 60 engines was premature. The company is talking of contracting for 100 locomotives, but no orders have yet been awarded. We have the types of 60 of these engines as follows: 25 are to be 10-wheel engines; 20 8-wheel passenger locomotives, and 15 switchers. 10 of these to be six-wheel engines.

CAR BUILDING.

The Missouri Pacific has recently ordered 28 new day cars, five chair cars and 12 sleepers.

The Youngstown Car Mfg. Co., of Youngstown, Ohio, has received a contract from the Lake Shore & Michigan Southern for building 100 coal cars, equipped with air brakes.

The Chesapeake & Ohio is in the market for freight cars, as already reported, but the number of cars to be ordered by the company has not been definitely decided. Very probably the number will not exceed 1,000 cars, 500 box and 500 60,000 lb. hopper bottom gondola coal cars.

The order of the New York Central & Hudson River Co. for passenger equipment placed with the Gilbert Car Manufacturing Co., of Troy, N. Y., last week was for 100 passenger cars instead of 130 as reported. The contract includes vestibule, smoking and combination cars as follows: 50, 54 ft. standard day cars with four wheeled trucks; 20, 54 ft. smoking cars with four wheeled trucks; 20, 60 ft. vestibule cars with six wheeled trucks, and 10, 60 ft. combination cars with six wheeled trucks. The day cars and vestibule cars will be finished in mahogany, and the smoking and combination cars in quartered oak, 30 cars have also been ordered from the Ohio Falls Car Co.

BRIDGE BUILDING.

Brantford, Ont.—The Grand River bridge, at Brantford, for the Toronto, Hamilton & Buffalo, which is being built by the Dominion Bridge Co., of Montreal, will be a pin connected structure, with three spans 100 ft. between pin centres, 14 ft. wide, having a 4-ft. footwalk outside of one truss.

Douglastown, N. B.—A contract for the substructure of the proposed iron bridge at Douglastown, N. B., tenders for which were advertised for, has been awarded to Lawrence Doyle. The contract price is understood to be about $3,400 for the stone abutments.

Hokendauqua, Pa.—The Lehigh and Northhampton County commissioners met at Catasauqua last week and decided to build a bridge over the Lehigh River between Upper Catasauqua and Hokendauqua, connecting the two counties.

Kansas City, Mo.—A Boston newspaper reports that a company of New England capitalists has been organized for the purpose of buying up the Winner bridge at Kansas City. Its President is Theo. C. Bates, of Worcester, and its Treasurer, Francis Sanborn. It has a capital stock of $400,000, all of which will be required to take up the underlying liens on the property. The structure has already cost about $700,000, and it will take from 500,000 to $600,000 to complete it. The new company is composed largely of the bondholders, and the purchase will be made in their interest.

Philadelphia.—Councils' Finance Committee has agreed to favorably recommend the passage of an ordinance appropriating $8,000 to be added to the original appropriation of $30,000 to the Department of Public Works, for the construction of a new bridge over the track of the Philadelphia & Reading at Thirty-first and Girard avenue. The lowest bid for this work was $8,000 in excess of the appropriation.

St. Albans, Vt.—The Central Vermont is doing a good deal of bridge work on its lines. A new bridge is being built between West Berlin and Northfield Falls, on the Central Division. A span of the Pike River bridge, at Pes Rivieres, is also being rebuilt by the Vermont Construction Co. Substantial repairs on the New London bridge are well along and when finished it will contain four new spans. When completed the bridge at Rouses Point will be practically a new structure. The old trestles have been replaced. The trestle work extends 3,0.0 ft. The new abutments being put in on the Bradley Bridge, Williston, is the largest piece of work of its kind on the road. It is to be 60 ft. high, 70 ft. wide, and will contain 2,200 yards of masonry. It is expected that work on the St. Johns-Bridge will be finished before winter. The bridge is being reconstructed, and a new iron draw will be built.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In Missouri in an action againgt a railroad for failing to furnish coal-cars ordered for a particular day, the evidence showed that the cars were delivered at 4 o'clock in the afternoon, and that the miners quit work at that hour, so that the cars could not be loaded that day. The Supreme Court rules that, where the railroad company was not required by the order to furnish the cars at any particular hour, the delivery at any hour of the day was sufficient.[1]

The Supreme Court of Oklahoma decides that where property is delivered to a carrier, consigned to a point beyond its line, and in order to reach the place of destination, must pass over the lines of several connecting carriers, in the absence of any arrangement constituting the carriers, partners or joint undertakers, each carrier is liable only for loss or injury occurring on its own line; and the last carrier is not liable for the property where it is not known that it received it[2].

In Texas the Supreme Court holds that a stipulation that the carrier should have the benefit of any insurance on the goods to be carried is valid without a special consideration therefor to the shipper[3].

In the same State it is held by the Supreme Court that in an action for damages for delay in delivering freight, to entitle plaintiff to show loss of the wages paid to his employés because the freight was held, it was not necessary for him to give the company notice that such loss would result from the delay[4].

In Arkansas a common carrier is liable for damages accruing to goods received for shipment from the time they are received, and not from the date of the bill of lading.[5]

The Supreme Court of Tennessee rules that though goods are shipped under a contract by which a special rate is charged and a rebate allowed, in violation of the interstate commerce act, such fact will not relieve the carrier of liability for the loss of the goods.[6]

In Indiana in an action by a quarry company against a railroad company for breach of contract to furnish strong and inspected cars for the transportation of stone, the complaint alleges that a car was delivered which was defective, and had not been inspected; that the defects were hidden and unknown to the quarry company, but would have been discovered on proper inspection by the railroad company; and that by reason thereof, and without fault of the qurrry company, the car broke loose, ran down a grade, and killed a quarryman. The Supreme Court rules that the facts stated were sufficient to show an inexcusable breach of duty by the railroad company.[7]

In Nebraska a railroad company cannot refuse to deliver japanned iron rings, designed for a neck yoke for horses, because the consignee refuses to pay freight on them as saddlery hardware, they being properly classified as common hardware.[8]

In Arkansas a railroad in hauling a car load of stock is liable as common carrier, though the car is the private property of the stock owner.[9]

In the same State a shipper of freight over one of two roads acting under a traffic agreement to use each other's lines cannot recover from the other for damages to goods shipped resulting from an alleged violation of the tariff agreement by such other road.[10]

Injuries to Passengers, Employes and Strangers.

In New York a ticket agent declared that a coin given by plaintiff in payment for a ticket was counterfeit, and demanded that she take it back and return the change he had given her. On her refusal, he denounced her as a counterfeiter and a common prostitute, and detained her for a while in the station, awaiting arrest by an officer, which was not made. The Court of Appeals holds that the agent was acting within the scope of his employment, and defendant is liable for false imprisonment, and for the slanderous words spoken.[11]

In Georgia it is laid down by the Supreme Court that where the failure of a passenger to have a ticket is due to the non-attendance of the agent at the ticket office, or to other fault or default of the company, the passenger is entitled to be carried at the ticket rate of fare, but when his failure is attributable to any other cause he has no right to be carried without paying the higher lawful rate exacted by the rules of the company.[12]

By a municipal ordinance of the city of St. Paul, a passenger who had paid one fare on any line in the city is entitled to a transfer check or ticket entitling him to a continuous passage over any connecting or crossing line. It is held by the Supreme Court of Minnesota that where such passenger applies for and accepts a transfer ticket for one of several continuous or crossing lines, plainly marked and designated, he will be limited to the line so selected, but where the route designated is not so limited, but is equally applicable to several lines, he will be entitled to be transported over either.[13]

In Maryland the Court of Appeals rules that in an action against a railroad company to recover damages, where a gateman refused to allow plaintiff to pass to a train because the date on his ticket was illegible, whereby he lost the train, plaintiff is not obliged to present his ticket to a ticket receiver if in the same condition as when received from defendant's agent, such a rule of the company being unreasonable.[14]

In Texas the Supreme Court holds that where plaintiff's ticket entitled him only to a continuous passage over defendant's railroad, he had no right to take a train running only to an intermediate point and take passage therefrom on another train that could take him to his destination, even though the latter train was the one he should have taken in the first instance, the voluntary breaking of his journey forfeiting his right to enter the second train on his original contract of passage.[15]

In the same State a ticket issued, not as a coupon ticket, but as the joint contract of several carriers, entitles the purchaser to transportation by each of the said carriers, notwithstanding that the delay of one of them may have occasioned the expiration of the ticket before its presentation to all.[16]

In the Federal Court it is held that the failure of a train carrying second-class passengers to connect with the proper train of another road, the two lines forming a through line, does not impose upon the second road an obligation to transport passengers holding second-class through tickets upon the next train—a limited express—upon which such tickets are not valid. One who has applied for and purchased a second-class ticket, and has used such tickets before, is bound by its terms, whether he has read them or not.[17]

In Massachusetts where a railroad makes a special contract with circus proprietors to haul their cars for a gross sum, the proprietors to load and unload, assume all risk of accident, and save the company harmless, the relation of the company to an employé of the circus, who travels on the train under such contract, is not that of a common carrier, and is not obliged to inspect the trucks of the cars, and is therefore not liable for an injury to such employé arising from a defective car truck, which inspection would have revealed.[18]

In Nebraska it is ruled that words of provocation will not justify an assault by a conductor on a passenger.[19]

In Missouri it is error to declare negligence *per se* for a passenger to attempt to board from a platform at a station a train while moving, no matter how slowly.[20]

In Georgia a railroad selling a ticket at a way-station for a train soon to pass is bound to stop the train long enough to afford the purchaser reasonable time to board it in safety; and if he, without delay other than is caused by passengers coming out of the car, endeavors to get aboard just as the train is starting, and is injured in consequenre of the too hasty starting of the train, causing the door of the car to close suddenly, it not being securely fastened back, mashing his hand, he is *prima facie* entitled to recover.[21]

In the Federal Court it is ruled that when a railroad company, by means of advertisements and reduced rates, induces an unusual crowd to collect at its stations, it is bound to use such means as are reasonably necessary to prevent injury to individuals from the conduct or pressure of the crowd in passing to and from its trains.[22]

In Massachusetts a contract whereby a passenger, in consideration of being allowed by a railroad company to ride in the baggage car, agrees to "assume all risk of accidents and injuries resulting therefrom, and hold said company free, and discharged from all claims and demands in any way growing out of any injuries received by him while so riding," relieves the company from liability to the passenger for injuries received by him while so riding, though his being in the baggage car did not contribute to the injury.[23]

In New York the plaintiff's intestate was drowned by stepping off a train of defendant at night, under the impression that it had arrived at the station, while in fact it had only stopped, as required by statute, before crossing another track. Nothing was said or done by defendant's employés to give this wrong impression, nor, on the other hand, had they warned passengers not to leave the train, though the stop occurred on a bridge. It was a dark night, and there was little light on the bridge. The Supreme Court rules that defendant was not liable for the death of the deceased.[24]

In Minnesota it is laid down by the Supreme Court that where by reason of a neglect to sound the whistle or ring the bell of a locomotive as it is approaching a dangerous crossing, the vigilance of a traveler upon the wagon road is allayed, and he is led into a position or situation in which his life is jeopardized and finally lost, his lack of vigilance cannot be held to amount to culpable or concurring negligence, as a matter of law.[25]

In the Federal Court of Appeals it is laid down that a mere disregard by an employé of a rule of a railroad company in relation to the coupling of cars, when, with the knowledge and acquiescence of the division superintendent of the road, such employé, and others coming under the rule, have constantly and without exception disregarded it, is not such negligence on the employé's part as will absolutely defeat his recovery for an injury caused by the negligence of the company.[26]

In Missouri it is held by the Supreme Court that a rule of the railroad company which forbids jumping on switch engines while they are in motion was not rendered nugatory by the fact that the employés violated it at will, where the evidence showed that it was enforced by the company, and the rule itself recited that the yardmen were in the habit of jumping on engines in the manner prohibited, and that its express purpose was to put an end to the practice.[27]

---

[1] McGrew v. M. P. Ry. Co., 19 S. W. Rep., 53.
[2] Church v. A., T. & S. F. R. Co., 29 Pac. Rep., 530.
[3] M. P. Ry. Co. v. Int. Marine Ins. Co., 19 S. W. Rep., 459.
[4] G. C. & S. F. Ry. Co. v. Loonie, 19 S. W. Rep., 385.
[5] St. L., A. & T. Ry. Co. v. Neel 19 S. W. Rep., 963.
[6] Insurance Co. of North America v. Delaware Mutual Safety Ins. Co., 19 S. W. Rep., 755.
[7] Hoosier S. Co. v. L., N. A. & C. Ry Co., 31 N. E. Rep., 365.
[8] C., B. & Q. R. Co. v. Gustin, 52 N. W. Rep., 814.
[9] Fordyce v. McElynn, 19 S. W. Rep., 961.
[10] St. Louis, A. & T. Ry. Co. v. Neel, 19 S. W. Rep., 963.
[11] Palmeri v. Man. R. Co., 30 N. E. Rep., 1,001.
[12] Georgia S. & F. R. Co v. Asmore, 15 S. E. Rep., 13.
[13] Pine v. St. Paul City Ry. Co., 52 N. W. Rep., 352.
[14] Northern Cent. Ry. Co. v. O'Connor, 24 Atl. Rep., 449
[15] Gulf, C. & S. F. Ry. Co. v. Henry (Tex. Sup.), 18 S. W., 870.
[16] G., C. & S. F. v. Looney (Tex. Sup.), 19 S. W., 1139.
[17] N. Y., L. E. & W. Ry. Co v. Bennett (Cir. Ct. App.) 50 Rep. F., v. 496.
[18] Robertson v. O. C. R. Co., 31 N. E. Rep., 630.
[19] Haman v. O. H. R. Co., 52 N. W. Rep. 830.
[20] Fulks v. St. L. & S. F. Ry. Co. (Mo. Sup.), 19 S. W. Rep., 818.
[21] Poole v. Georgia R. & B. Co. 15 S. E. Rep., 321.
[22] Taylor v. Penn. Co., 50 Fed. Rep., 755.
[23] Hosmer v. O. C. R. Co., 31 N. E. Rep., 662.
[24] Davis v. Lehigh Val. R. Co., 19 N. Y. S., 516.
[25] Hendrickson v. G. N. Ry. Co., 51 N. W. Rep., 1,044.
[26] Northern Pac. R. Co. v. Nickels, 50 Fed. Rep., 718.
[27] Francis v. K. C., St. J. & C. B. R. Co., 19 S. W. Rep., 935.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Northwestern, quarterly, 1¾ per cent., on the preferred, and 3 per cent. on the common stock, payable Dec. 23.

Chicago, St Paul, Minneapolis & Omaha, semi-annual, 3½ per cent., on the preferred stock, payable Jan. 20.

Housatonic, annual, Bridgeport, Conn., Dec. 20.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic & Pacific, annual, Boston, Mass., Dec. 8.

New York, Lake Erie & Western, annual, New York City, Nov. 29.

Philadelphia, Newtown & New York, special, Norristown, Pa., Nov. 28, to consider an increase of bonds to $1,000,000.

Ulster & Delaware, annual, Rondout, N. Y., Dec. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its next annual meeting at Lookout Mountain Hotel, Chattanooga, Tenn., beginning Nov. 15, having been postponed from Oct. 18.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Wednesday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

Canadian Society of Civil Engineers.

A meeting will be held at the Society's rooms, 112 Mansfield street, Montreal, on Nov. 25. At this meeting the discussion on "Transition Curves" will be resumed and a special paper on the same subject by Mr. M. W. Hopkins, A. M. Can. Soc. C. E., will be read.

Civil Engineers' Club of Cleveland.

The regular meeting of the club was held Nov. 8. John G. Oliver and George C. Bardous were elected Active Members and Charles Orr an Associate Member. The paper of the evening was read by Dr. E. W. Morley, Professor of Chemistry of Adelbert College, on the subject, "Weighing Gases." A brief abstract follows:

WEIGHING GASES.

The determination of the atomic weight of oxygen is important in itself, and it has an important bearing on the hypothesis of the unity of matter. One process for determining this atomic weight consists in determining the ratio of the volumes in which oxygen and hydrogen combine, and then determining also the ratio of the densities of the two gases; twice the product of these two ratios is the atomic weight desired.

The experimental problem is one of considerable difficulty, since the gross weight of the vessel containing the hydrogen weighed is 650 times that of the gas. Since an accuracy of one part in 20,000 in weighing the gas is none too great (though probably impossible), it is obvious that the gross weight ought to be determined (if possible) with an accuracy of one part in 12,000,000. It is necessary to determine the temperature, pressure, volume and weight of a portion of the gas in question. In some experiments the temperature and pressure of the gas were determined at the instant of closing the stop-cock of the globe in which the gas was to be weighed. The observation cannot, therefore, be repeated, and great accuracy is therefore difficult to obtain. In experiments now in progress the temperature and pressure of the gas is not determined; but these are made equal to those of a carefully preserved standard quantity of gas, whose temperature and pressure were once for all determined with extraordinary care by many observations. This equality can be repeatedly observed, so that greater accuracy is attainable. The globes in which the gases are weighed had their volumes determined by modification of the usual process; the displacement of a globe containing 20 litres could be determined by means of a balance capable of carrying only one litre of water. Eight globes have been provided and their volumes determined. The use of so many globes reduces the effect of accidental errors of the determination of volume. The volumes of the counterpoises of the globes are made equal to those of the globes themselves within less than one part in 200,000, and the compression on exhaustion, which was determined within one part in 1,000,000, was accurately compensated. The globes, with their counterpoises, while in use in an experiment, are inclosed in a disiccator and not touched, suitable mechanism being provided for effecting necessary manipulations without opening the disiccators. The weighing is effected by the method of reversals. By means of suitable mechanism the globe and its counterpoise can be hung from each pan of the balance alternately, the observer remaining at a distance throughout the operation. The accuracy attained is satisfactory, the average error in determining the weight of a globe containing 21 litres being one part in 16,000,000. The results so far attained indicate that the atomic weight in question is 15.88. It is hoped that the experiments now described, together with experiments by other methods not here mentioned, will suffice to determine the third decimal place with a good degree of approximation.

Engineering Society of Toronto.

The Engineering Society of the Toronto School of Practical Science, held a regular meeting last week, the president, W. A. Lee in the chair. A paper on "Bridge Specifications," by T. K. Thomson, a former graduate, was read. A discussion followed, by Messrs. Duff, Lane, Laing, Leschinger and others.

Engineers' Club of St. Louis.

The Club met at 8 p. m., Nov. 16, with President Johnston in the chair. 21 members and two visitors present.

The paper of the evening on "The Graphical Representation of the Output and Efficiency of Operation of a Dynamo" was then read by Prof. F. E. Nipher, who stated that all of the quantities involved can be represented in terms of total E. M. F., magnetizing current, and speed. The equation just published by Frolich represents the relation between these quantities in a very satisfactory way in a dynamo, which will run with brushes at a practically constant lead. The equation is

$$= \frac{a \;\; n\,i}{1 + b\,i}$$

where a and b are constants of the machine.

The constants are easily determined, by determining a series of simultaneous values of $e\,n$ and i through the range of speed and current which the machine will permit. Putting the equation in the form

$$\frac{n\,i}{e} = \frac{1}{a} + \frac{6}{a}\,i$$

and plotting i with the corresponding value of $\frac{n\,i}{e}$ the values $\frac{1}{a}$ and $\frac{6}{a}$ can be taken from the diagram and a and 6 can be found. The equation is the equation of an hyperbolic paraboloid, upon which lines of constant output and constant efficiency and constant torque can be drawn. The speaker showed how to draw projections of all these lines on the co-ordinate planes of e, i, e, n and i, n, any two of which enables one to clearly see what the dynamo would be able to do under any permissible conditions of operation.

The paper was discussed by Messrs. Seddon, Olshausen, Hermann, Humphrey, Wheeler and Johnson.

National Transportation Association.

The meeting of this organization held at Buffalo Nov. 16 and 17 was briefly noted in our Traffic columns last week. In addition to the business reported then, Mr. Iglehart, of Chicago, presented a report on demurrage. The report recommended further discussion by members with railroad men before asking Congress to make any law. Several railroad officers had been seen who expressed a willingness to adopt rules embodying a provision giving shippers a claim against the railroad for demurrage in cases where freight was delayed in transit. A committee was appointed on Uniform Classification. This Association is composed of the following organizations: Board of Trade of Chicago, Cincinnati Chamber of Commerce, St. Louis Merchants' Exchange, Minneapolis Chamber of Commerce, Boston Chamber of Commerce, Buffalo Merchants' Exchange, Milwaukee Chamber of Commerce, Louisville Board of Trade, Peoria Board of Trade, Indianapolis Board of Trade, Duluth Board of Trade, Detroit Board of Trade, Toledo Produce Exchange, Kansas City Transportation Bureau, Chicago Freight Bureau, Millers' National Association of the United States, Baltimore Corn and Flour Exchange, Philadelphia Commercial Exchange, Omaha Commercial Association, New Orleans Board of Trade, Denver Commercial and Industrial Association, Manufacturers' Club of Philadelphia, National Paint and Varnish Association of St. Louis.

New York Railroad Club.

The annual meeting of the New York Railroad Club was held Thursday evening, Nov. 17. The following officers were elected: *President*, R. C. Blackall, General Superintendent Motive Power, Delaware & Hudson Canal Co.; *First Vice-President*, George W. West, Superintendent Motive Power, New York, Ontario & Western; *Second Vice-President*, A. E. Mitchell, Superintendent Motive Power, New York, Lake Erie & Western; *Third Vice-President*, W. H. Lewis, Master Mechanic, Delaware, Lackawanna & Western; *Secretary*, J. A. Hill, Editor *Locomotive Engineering*; *Treasurer*, C. A. Smith, Union Tank Line. *Executive Committee:* Thomas Millen, Master Mechanic, New York & Northern; W. C. Ennis, Master Mechanic, New York, Susquehanna & Western; H. H. Vreeland, Superintendent New York & Northern; W. W. Snow, Ramapo Iron Works; W. G. Wattson, Division Superintendent West Shore. *Finance Committee*: Thomas Prosser, Thomas Prosser & Sons; E. H. Andress, Andress Paint & Color Company; F. M. Patrick, H. W. Johns Manufacturing Company.

The American Society of Mechanical Engineers.

The annual meeting of this Society will be held in New York, Nov. 29 to Dec. 2. The professional sessions will be held at the house of the Society, No. 12 West Thirty-first street. The following is a list of the papers which will be read:

"Tests on the Triple Engine at the Massachusetts Institute of Technology," C. H. Peabody; "An Interesting Boiler Explosion," F. H. Daniels; "Strains in the Rims of Fly-band Wheels produced by Centrifugal Force," James B. Stanwood; "An Analysis of the Shaft Governor," F. M. Rites; "A New Process for Cutting Cams," W. A. Gabriel; "A Simple Difference Engine," George Richmond; "The Strains in Lathe Beds," Geo. W. Bissell; "Tests of Carrying Belts," Samuel Webber; "Limit of Propeller Efficiency as determined by Surface Form of the Propeller," W. F. Durand; "Notes on the Refrigeration Process and its proper place in Thermodynamics," George Richmond; "Hydraulic Reaction Motors," De Volson Wood; Negative Specific Heat, De Volson Wood; "Shall there be an overhauling of the right to use the title Engineer?" H. F. J. Porter; "Is the Weaving Shed design the best form of construction for a machine shop?" John E. Sweet; "To what extent can the milling machine replace the planer?" W. S. Rogers; "Experimental Determination of the heat generated per candle power in oil lamps," D. S. Jacobus; "A new Recording Pressure Gauge for extremely low Ranges of Pressure," W. H. Bristol; "Tests of a Pump Receiving Suction Water under Pressure," R. Van A. Norris; "A New Transmissive Gearing," H. C. Spaulding; "Comparative Variation in Economy with change of load in a simple and compound engine," R. C. Carpenter; "Performance of an overhead traveling crane operated by a single electric motor," Anthony Victoria; "A New Graduating Steam Radiator," John T. Hawkins.

PERSONAL.

—Mr. E. S. Goodman, General Freight Agent of the Savannah, Americus & Montgomery, has tendered his resignation to take effect Dec. 15.

—Mr. D. B. Robinson, who has been President of the San Antonio & Aransas Pass Road since last June, has resigned that office, and after Jan. 1 will give his entire time to the Santa Fe, Prescott & Phœnix, now being built in Arizona, and of which he is President. Mr. Robinson was formerly General Manager of the Atlantic & Pacific.

—Mr. Francis Collingwood, Secretary of the American Society of Civil Engineers, delivered a lecture on the "Brooklyn Bridge" last week before the engineering students of the University of the City of New York. The lecture is one of a course of addresses to be made by eminent engineers before the engineering classes of the University.

—Hon. G. E. Todd, ex-superintendent of the Northern New Hampshire road, died Nov. 16, at Concord, N. H., aged 63 years. He was born in Cambridge, Mass., 1830, and entered railroad service in 1848, on the Northern New Hampshire, as clerk in the freight house at Lebanon. He was superintendent of the road from 1866 to 1884, and held a similar position after its lease to the Boston & Main until failing health compelled him to resign. Mr. Todd was a director of Northern, Concord & Claremont and Peterboro & Hillsboro companies. He was a member of the House of Representatives in 1872 and 1873, and of the Senate in 1874 and 1876.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The annual meeting was held in Baltimore, Nov. 21, 122,329 shares being represented. The directors elected were James Sloane, Jr., William F. Burns, William H. Blackford, Aubrey Pearre, George de B. Keim, Wesley A. Tucker, Maurice Gregg, J. Wilcox Brown, William F. Frick, George A. von Lingen, George C. Jenkin and Charles J. M. Gwinn.

Boston, Revere Beach & Lynn.—The annual meeting was held at Boston, Nov. 17. The following directors were elected: Joseph S. Riker, Amos F. Breed, Melvin O. Adams, Elijah B. Stoddard, Henry F. Hurlburt, Matthew Bolles, M. Shepard Bolles. The directors elected as President Melvin O. Adams and as Treasurer and Clerk John A. Fenne.

Bridgton & Saco River.—The annual meeting of the stockholders at Bridgton, Me., Nov. 16, re-elected William F. Perry, President; P. P. Burnham, Treasurer; J. A. Bennett, Superintendent.

Buffalo, Rochester & Pittsburgh.—The annual meeting of the stockholders was held at the office of the company, No. 38 Wall street, New York, on Nov. 21. The old directors were re-elected. They are Arthur G. Yates, Warren A. Wilbur, J. Kennedy Tod, W. Emlen Roosevelt, Wheeler H. Peckham, George H. Lewis, Adrian Iselin, Jr., R. M. Gummere, Edward N. Gibbs, Walston H. Brown, Frederick H. Brown, Wilson S. Bissell and Frederick A. Bell.

Canadian Pacific Dispatch.—The following appointment took effect Nov. 15, 1892: H. G. Leslie, Contracting Agent, with office at No. 197 Washington street, Boston, in place of George E. Smalley, resigned.

Central New York & Western.—The directors of this company, formerly the Lackawanna & Southwestern, are: Stephen A. Lathrop, Lewis F. Wilson, C. Walter Artz and Percy W. Sherman, of New York; C. Weidenfeld, of Orange, N. J; F. S. Smith and J. S. Rockwell, of Angelica, N. Y.; Logan C. Newsom, of Columbus, O.; W. M. Smith, of Brooklyn; Henry S. Hastings, Pa.; Clarence M. Smith, of Rosebank, N. Y., and Frank P. Byrne, of Detroit.

East Tennessee, Virginia & Georgia.—At a meeting of the directors on Nov. 22 W. G. Oakman was re-elected President and Gen. Samuel Thomas was re-elected to the office of Chairman of the Board, which he resigned last March, at the time of the announcement of the Olcott plan of reorganization. Mr. Oakman is Receiver of the Richmond & West Point Terminal Co.

Lake Shore & Michigan Southern.—Charles H. Chevee has been appointed Traveling Passenger Agent, vice F. P. Howe, resigned, with office at 21 Exchange street, Buffalo.

Naugatuck.—The annual meeting was held at Bridgeport, Conn., Nov. 16. Directors were elected as follows: W. D. Bishop, S. S. Dennis, J. A. Sperry, D. W. Plumb, R. M. Bassett, W. D. Bishop, Jr., F. J. Kingsbury, C. E. Brooker and A. H. Robertson. The following officers were chosen: President, W. D. Bishop; Treasurer, W. L. Squire, of New Haven; Secretary, Horace Nichols, of Bridgeport.

Philadelphia Belt Line.—Below is a list of the officers of the company: Francis B. Reeves, President, and John Curly, Secretary, room 30, Merchant's Exchange, Third and Walnut streets, Philadelphia; Richard Tull, Treasurer, 227 South Fourth street, Philadelphia; John A. Wilson, Chief Engineer, and D. Jones Lucas, Principal Assistant Engineer, Drexel Building, Philadelphia; and F. A. Mollitor, Assistant Engineer, 2033 Richmond street, Philadelphia. The company has in operation 2.6 miles of track on its main line and 0.9 miles on branches.

Port Royal & Augusta.—The annual meeting of the stockholders was held at Augusta, Nov. 15. The old officers were re-elected as follows: President, H. M. Comer, of Savannah; Secretary, E. Workman, and the old directors.

Richmond, Fredericksburg & Potomac.—The sixtieth annual meeting of the stockholders was held at Richmond, Nov. 17. The directors were re-elected as follows: E. T. D. Myers, President; Board of Directors: Moncure Robinson, Jr., of Philadelphia; H. G. Ward, of New York; W. T. Walters, and B. F. Newcomer, of Baltimore. Dr. L. B. Anderson, of Norfolk, was announced as director on the part of the state.

Savannah, Americus & Montgomery.—William Argue, Master Mechanic at the Montgomery shops, has been succeeded by M. M. Reid, who until recently has been connected with the Norfolk Southern, with headquarters at Berkley, Va.

Southern Pacific.—R. J. Duncan, who was formerly the Superintendent for the Union Pacific, Denver & Gulf, and after his resignation went to Wyoming to engage in mining operations, has settled in California as Superintendent of one of the divisions of the Southern Pacific.

Turbotville & Williamsport.—The directors of this new Pennsylvania company are: Rudolph T. McCabe, New York, President; Samuel B. Haupt, W. R. Heath, New York; Harry C. Bubb, William Gibson, Seth T. Forsman, Seth T. McCormick.

Yazoo & Mississippi Valley.—J. A. Ridgely, Acting Auditor of the company, has been transferred to Chicago. J. C. French, Paymaster; Robert Hazlehurst, Assistant Treasurer, and about 15 clerks in the auditor's office at Memphis will lose their positions by the transfer.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Baltimore & Drum Point.—The newspaper reports that work is to be resumed immediately on this road south of Baltimore, Md., are erroneous. Efforts are being made to raise funds to complete the line, but the arrangements have not been completed. The road is projected through the Anne Arundell and Calvert Counties, Md., and will be about 80 miles long, of which 60 miles were graded about two years ago, and the cross ties delivered. O. W. Barnes, 57 Broadway, New York City, is the Chief Engineer.

Bare Rock.—The charter of this company was only filed with the Secretary of State, at Harrisburg, Pa., last week, but it seems that the road is not a new line. It has been in operation during all of 1892 between Milford, Pa., near Rockwood, on the Somerset & Cambria branch of the Baltimore & Ohio, to Bare Rock, a distance of 2½ miles. The officers of the company are: John Murdock, President; J. M. Murdock, Treasurer, and W. F. Murdock, Secretary, all with offices at 38 Franklin street, Johnstown, Pa.

Beech Creek.—The branch of this road now under construction is from Kerr Moor, Pa., the station above Gazzam, the southern terminus, to Mehaffey, on the west branch of the Susquehanna River, a distance of about 12 miles. Connection is made at that point with a branch of the Cambria & Clearfield, one of the lines of the Pennsylvania, and the track of that road used to Patton, under a traffic agreement, making the lines virtually a joint one for both companies. At Patton a very large body of coal land is being developed.

Cambria & Clearfield.—On Nov. 21 another large portion of this road, now being built by the Pennsylvania Railroad, will be opened for traffic, and will be operated as a part of the Altoona Division. This new line is called the Susquehanna Division, and extends from Bradley Junction, 11¼ miles from Cresson, to the new town of Spangler, a distance of 12 miles. This line has upon it the following branches which will bring a large bituminous coal tonnage to the road: The Powell & Hoppel Branch, leaving the Susquehanna Division at a point 8.5 miles from Bradley Junction and extending a distance of 5,300 ft. to the Powell mine, with a switchback 4,100 ft. in length to the Hoppel mine. The Luther Branch, 3,300 ft. in length, extending from a point 6.9 miles from Bradley Junction. Lantzy Branch, diverging from the Susquehanna Division at a point 9.4 miles from Bradley Junction, and extending a distance of 2,700 ft. to the Holt and Thompson mines. Walnut Run Branch, leaving the Susquehanna Division

at a point 12 miles from Bradley Junction, and extending up Walnut Run for a distance of 2.2 miles, to mines of the Cambria Coal Co. At a point 10 miles from Bradley Junction a water station has been located between the south end of the Spangler "Y" and the main line of the Susquehanna Division, so arranged as to deliver water upon either track. The portion of the Cambria & Clearfield system, between La Jose and Mehaffey, has also been completed, and will be opened for traffic on Nov. 21. This line extends in a northwesterly direction from La Jose for a distance of 4½ miles, about one-half mile past the point where a connection has been made with the Beech Creek road, at the south end of its bridge over Chest Creek, in the vicinity of Mehaffey. A water station, fed from gravity supply, has been located at Snyder Run, about 2.3 miles northwest from La Jose, and about midway between La Jose and Mehaffey.

Canada Western.—Acting under instructions from Frank Bakeman, of Chicago, trustee of the company, Mr. Blackmar has sent into the field Civil Engineer Going with instructions to make reconnaissance of the country lying between Duncan's Bay and Como, B. C. At the latter place he will be joined by Engineer Nevins, and the location survey will then be commenced.

Canadian Pacific.—President Van Horne takes occasion to deny the newspaper story that his company would build a new line to the Kootenai mining district, in the southern part of British Columbia. The company is now building a line from Fort McLeod, which is the southern terminus of the new Calgary & Edmonton Railroad, west, toward the summit of the Rocky Mountains and Crow's Nest Pass; and it was the report that this line would be extended to the Kootenai mining district which President Van Horne denies. He says that the company will depend upon the Columbia & Kootenai Road from Nelson to Robson, B. C., which extends along Kootenai River connecting the southern part of Kootenai and Lower Arrow Lake, and the steamer navigation on these lakes from the main line at Revelstoke, B. C., to reach the district.

Columbia & Kootenai.—This company will apply to the parliament of Canada, next session, for an act authorizing it to construct a road between a point on its present line and Revelstoke, B. C., on the Canadian Pacific. The road is operated by the Canadian Pacific and extends from Robson to Nelson, B. C.

Connecaut Terminal.—The company has been incorporated in Ohio, the capital stock being placed at $1,050,000 and the incorporators are Samuel B Dick, of Meadville, Pa.; Allen M. Cox, Conneaut, O.; Thomas H Wells, Youngstown; F. E. Huttman, Cleveland, and A. C Huidekoper, Meadville, Pa. The company is to build a road from a point on the west bank of Conneaut Creek, where the creek empties into Lake Erie, to the connection with the Pittsburgh, Shenango & Lake Erie where it crosses the New York, Chicago & St. Louis Railroad. The incorporators are interested in the Pittsburgh, Shenango & Lake Erie.

Elgin, Joliet & Eastern.—The contract for grading on the extension from McCool, the present eastern terminus, to Porter, Ind., is reported to have been let to Hannon & Co., of Chesterton, Ind. The line will be about five miles long and will be completed before Jan. 1. The work has already begun.

Gouverneur & Oswegatchie.—The tracklaying on this branch of the Rome, Watertown & Ogdensburg to St. Lawrence County, N. Y., has just begun. Rails are arriving daily, and the track will probably reach Hailesboro, the first station from Gouverneur, this week. The line is being built along the Oswegatchie River from Gouverneur east to Edwards, N. Y., about 15 miles, to reach large paper mills.

Great Northern.—The track on the Pacific extension has been laid at the rate of two and three miles a day for some time and it is expected the tracklaying forces have reached the end of the graded road. It is expected that the last rails will be laid before Dec. 1. The gap between the ends of track is from Tumwater Canon to a point a short distance west of the Cascade summit. The rails have been laid to these two points from either side, and the road surfaced and ballasted as far as the rails have been laid. Mr. Siems, of Shepard Siems & Co., the contractors for the extension, says: "Our firm began breaking ground from Pacific junction, at Milk River, Mont., westward, on Oct. 8, 1890, and this month our contract will be finished to the summit of the Cascade mountains. We have employed upon an average from 7,000 to 8,000 men, and have built 700 miles of roadbed and laid the track."

Houston Belt & Magnolia Park.—The receiver has been authorized to issue certificates for the payment of claims against the company, and to secure funds for the proposed extension to Harrisburg, Tex., which will be about two miles long. It is the intention to connect at that point with the La Porte, Houston & Northern, and work will not be begun until the track has been laid on that road. Trains will be run from Houston to La Porte, Tex., on Trinity Bay.

Marion & Rye Valley.—The company having failed to pay the contractors their various monthly estimates, work for the present has been discontinued, and a suit is now pending for the amount due. The road is being built from Marion, Va., south through the Rye Valley to a point on the Holston River, and it was expected that the first seven miles, to mines owned by the builders, would be completed this year. P. S. Swain, 32 Broadway, New York, is President of the company.

Middle Georgia & Atlantic.—The stockholders of the Seaboard Construction Co., which is building this road, at a meeting at Savannah on Nov. 12, ratified the proposed agreement for completing the line to Covington, Ga. A syndicate has been formed in Savannah, which has agreed to advance $150,000 to complete the road from Eatonton, northwest to Covington, Ga., 26 miles; this part of the line having previously been graded. The track will be laid by the company under the direct supervision of the Superintendent, J. A. Droege, of Eatonton, Ga.

Ohio Southern.—The contract for 20 miles of the Lima extension has been let to McArthur Bros., of Chicago. The line will be about 56 miles long from Springfield, north, through Degraff and other small towns to Lima, O. An important part of the right of way has been secured, and the subsidies from the towns will lessen the cost of construction.

Ottawa & Gatineau Valley.—The progress of the work on this road north of Farrellton, Que., has been recently referred to. The line is now in operation from Hull opposite Ottawa north along the Gatineau River through Chelsea and Wakefield for a distance of 41 miles. The line has been graded five miles further to near Kazabazua. It has been surveyed to Desert Village, the northern terminus, about 60 miles from Hull. The officers are: H. J. Beemer, President, 162 St. James street, Montreal; C. H. McIntosh, Vice-President, Ottawa; W. D. Harris, Chief Engineer, Ottawa, and J. T. Prince, General Superintendent, Ottawa.

Pennsylvania.—The following new work has been placed under contract on the main line of the Pennsylvania: Extension of masonary of Little Juniata bridges Nos. 8, 9, 10 and 11. These bridges are now for two tracks only, and will be extended by Brown Bros. & Sims, Contractors, so as to accommodate three tracks. Grading and masonry work for two additional tracks from Christiana to North Bend, a distance of 2½ miles, McCourt & Laverty, contractors. Grading and masonry work for two additional tracks from Bird-in-Hand to Conestoga, a distance of 5 miles. L. L. Bush & Co., contractors. Drake, Stratton & Co., New York, have been awarded the contract for extending third track between Mare-Bridge and Longfellow, a distance of 5 miles. Sparks & Evans have a contract for the extension of Mill Creek bridge, making it to accommodate four tracks instead of three as at present. C. N. Stark, of Greensburg, Pa., has been awarded contract for excavation and masonry for fourth track from Coal siding, near Huntingdon, to Schneider's Cut, a distance of 4 miles.

St. Catherines & Niagara Central.—The City Council of Hamilton, Ont., at its last meeting refused to sanction the application of a large number of taxpayers, who asked that a by-law be submitted to the citizens asking them to grant a bonus of $125,000 for an extension to Hamilton, Ont.

Southbridge, Sturbridge & Brookfield.—Sealed proposals will be received at the office of the Chief Engineer until Nov. 30, for the gradation, masonry and highway and trestle bridges on the above road, which is 13 miles in length from Southbridge, to East Brookfield, Mass. The road connects with the New York & New England and the Boston & Albany, and gives Southbridge a western outlet. The line was fully described in our issue of Sept. 2. A. C. Moore, of Southbridge, is Chief Engineer.

Stillmore Air Line.—A charter was granted last week by the Secretary of State for this company, the incorporators being George Brinson, Leonard Phinizy, Albert G. Sherman, H. J. Biddenback and T. S. Wyley, Jr. The road is to be 32 miles long, and to extend from Collins, in Tatnall County, to Swainsboro, in Emanuel County. The capital stock is $250,000.

Tobesofkee Valley.—The work on the extension east to Plaster Rock, N. B., has been discontinued for this season. About 12 miles of track has already been laid and two more miles will complete the extension. The work will be resumed in the spring when the iron bridge which will be necessary, will be built.

Turbotville & Williamsport.—Rudolph T. McCabe, of New York, is President, and Harry C. Bubb, William Gibson, Seth T. Foreman and Seth T. McCormick, of Williamsport, and Samuel B. Haupt and William R. Heath, of New York, directors of this company, which was chartered at Harrisburg, Pa., Nov. 18, with a capital stock of $300,000. The line will be 30 miles in length, extending from Turbotville, Northumberland County, to Newberry Junction, near Williamsport, Pa.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—At the annual meeting of stockholders in Baltimore the present directors were reëlected. The report shows that for the nine months ending June 30 last the total earnings were $18,9 7,574, the total expenses were $13,896,578, and the net earnings $5,060,996. For the twelve months ended Sept. 30 last the total earnings were $26 034,167, against $24,530,395 for the twelve months ended Sept. 30 1891, an increase of $1,503,772. The expenses were $18,595 801, as compared with $17,078,233 the previous year, an increase of $1,517,568. Thus the net earnings were $7,438,366, against $7,452,162, a decrease of $13,726. A dividend of five per cent. was paid on the first preferred stock, amounting to $180,000; a dividend at the same rate on the second preferred stock amounting to $1 0 000, and another at 1½ per cent. on the common stock amounting to $312,428. Payments were made amounting to $674.057 to retire the bonded debt, against $471,557 the year previous, an increase of $202,500. The tonnage carried amounted to 15,657,596 tons (September being estimated.) Last year the tonnage was 14,858,872. The expenditures for betterments aggregated $2,061,604 (September being partly estimated), while for the fiscal year 1891 they were $1,601,902. The Philadelphia division shows gross earnings for the year of $2,0 6,414, an increase of $156,776; exp nses, $1,408 177, an increase of $64,997; net earnings, $684,236, an increase of $9 ,778. The operations of the Staten Island Rapid Transit Railroad shows: Gross earnings, $1,045,612, an increase of $29,014; net earnings, $379,435, a decrease of $4,562; increase of surplus, $3,159.

Buffalo, Rochester & Pittsburgh.—At the annual meeting in New York, Nov. 21, the stockholders approved the leasing of the road now being constructed by the Clearfield & Mahoning. To conform to the laws of Pennsylvania a special meeting of the stockholders will be held at Ridgway, Penn., this week to vote upon the question of guaranteeing the stock and bonds of the company, as provided by the terms of the proposed lease. The line is 27 miles long and is being built to connect this road with the Beech Creek. It extends from Du Bois, east to Jefferson Line, Pa.

Central New & York Western.—The Lackawanna & Southwestern, whose property and franchises were sold under a judgment of foreclosure some time ago, was reorganized this week under the name of the Central New York & Western, with a capital of $1,000,000.

Chignecto Marine Transport.—Notice is given that a joint special meeting of the shareholders and of the holders of the outstanding mortgage bonds of the company will be held at London, Eng., Dec. 12, for the purpose of authorizing the directors to issue a new series of first preference mortgage bonds to the amount of £35,000 sterling.

Kansas City, Wyandotte & Northwestern.—Judge Caldwell, of the United States Circuit Court, at Kansas City, on the application of Jay Gould and Russell Sage, owning 1,315 shares, ordered the sale of the road on Nov. 21. The sale was ordered to meet the mortgage held by the Farmers' Loan & Trust Co. The full value of the stock is $3 750,000. The Farmers' Loan & Trust Co. foreclosed on the property about six months ago, since which it has been operated by Newman Erb, of Kansas City as Receiver. A majority of the stock has been sold by the Missouri Pacific.

Marietta & North Georgia.—The reorganization committee gives notice that a majority of the securities of the company have been deposited with the Atlantic Trust Co., New York, under the reorganization agreement of May 12, and that the same has been declared effective. The additional deposit of bonds and stock will be received by the Atlantic Trust Co until Dec. 17. This committee is composed of H. A. V. Post, New York; Thomas Carmichael, London; Newman Erb, Kansas City; Walter Stanton, New York, and E. E. Denniston, Philadelphia.

Montreal & Sorel.—A syndicate, composed of the Hon. Louis Fourrillex and Messrs. Joel Leduc, H. Beauchemin and J. M. Fortier, will, it is reported, shortly assume control of this road, which will be reopened for traffic Nov. 15.

New York & New England.—A special meeting of the stockholders was held in Boston Nov. 21, to ratify the leases of the Meriden, Waterbury & Connecticut River and Providence and Springfield roads, and the leases were approved by a vote of 189 677 shares in favor and 1 450 against the proposition. Counsel for N. I. Goldsmith, who has recently brought a number of suits against the directors in the New England courts, objected to the lease of the roads, declared that the roads were unprofitable, and made charges against several of the directors. President Parsons asserted that the lease would be a valuable one to the company. "Under the lease the expenses will only be about $20 000 a year. One reason that the road has not been self-supporting heretofore has been that it is only 28 miles long and the salaries and other charges were heavy. We have cut down expenses $9,000 a year, and the New England road received freight enough from that little piece of road to make $65,000 a year. If we don't ratify this we shall lose that."

Richmond & West Point Terminal.—Judge Bond, of the United States Court at Baltimore, has signed an order authorizing Receiver Walter G. Oakman, of the Richmond Terminal Co., to institute proceedings to secure the cancellation of a contract by which the Terminal Co. purchased $12,000,000 of the capital stock and $3,5 3 000 of the collateral trust bonds of the Georgia Co., which controls the Central of Georgia. Mr. Oakman is also authorized to institute suits to recover money which the Terminal Co is alleged to have lost in the transaction. The order is similar to one previously passed in New York.

Union Pacific.—The report of operations for September and nine months, is published below: The gross increase for the month was $266,167. Expenses increased $211,185, leaving a net increase of $54,982 for the system. The Oregon Railway & Navigation and the Union Pacific, Denver & Gulf divisions make the most unfavorable exhibits. The detailed figures of the system and of several of the divisions follow:

OREGON SHORT LINE AND UTAH NORTHERN.

September.	1892.	1891.	Inc. or Dec.
Gross earnings	$6 7 388	$537,726	I. $ 9 6?
Operating expenses	379,1 8	365,925	I. 13,5 2
Net earnings	$287,760	$271,810	I. $16,160
Mileage	1,424	1,4 1	I. 3
Since Jan. 1.			
Gross earnings	$5,291,967	$5 621,902	D. $329,934
Operating expenses	3 186,183	3,46 ,841	D. 276,657
Net earnings	$2 105,784	$2,159,061	D. $53,278

UNION PACIFIC SYSTEM (PROPER).

September.			
Gross earnings	$4,391,683	$4,192,539	I. $202,144
Oper. expenses	2,422,249	2,253,749	I. 168,500
Surplus	$1,972,434	$1 938,790	I. $33,644
Mileage	7,671	7,668	I. 3
Since Jan. 1.			
Gross earnings	$30,976,322	$30,309 409	I. $666,912
Oper. expenses	19,770,186	20,09 ,575	D. 322 189
Surplus	$11,206,136	$10,216,033	I. $989,131

GRAND TOTAL OF UNION PACIFIC SYSTEM.

September.			
Gross earnings	$4,485,217	$4,319 050	I. $166,167
Oper. expenses	2 546,750	2,335,564	I. 211,185
Surplus	$2,038,467	$1,983,185	I. $54,982
Mileage	8,147	8,143	I. 4
Since Jan. 1.			
Gross earnings	$32,388,931	$31,165,398	I. $1,223,533
Oper. expenses	20,744,121	20,8 6,770	D. 82,648
Surplus	$11,644,809	$10,338,627	I. $1,3 6,182

TRAFFIC.

Traffic Notes.

The Pittsburgh & Lake Erie and the Lake Shore have put on a day train each way between Pittsburgh and Buffalo, running through in 8 hours, about 1½ hours quicker than the best present time.

The contract of the Adams Express Company with the Lehigh Valley Railroad will expire about Jan. 1, and it is said that the United States Express Company will then take the place of the Adams.

A press dispatch states that the Pennsylvania Railroad has contracted to transport all the coal from the mines of the Kingston Coal Company, at Wilkes Barre, Pa., for five years. It is said that these mines are now shipping 1 0,000 tons a month.

Secretary Jewett, of the Southwestern Railway & Steamship Association, which has practically gone to pieces, has at the request of some of the lines interested called a meeting to be held Dec. 5, to see if anything can be done toward forming a new association. The meeting will probably be held in New York City.

The Long Island Railroad has abrogated its rule requiring passengers holding mileage tickets to present them at the ticket office to be exchanged for a trip ticket instead of handing them to the conductor for passage in the usual way. The dissatisfaction of passengers, as reported in the newspapers, evidently was too strong to be trifled with.

The Missouri, Kansas & Texas has made a further cut in the rates on wire and nails and kindred commodities from St. Louis to Texas common points. The rate is now 31 cents, while the agreed rate is 72 cents from St. Louis. This is only one of numerous cuts being made in rates in this territory since the collapse of the Southwestern Railway and Steamship Association.

The Southern Pacific has given notice to its connections and general passenger agents generally that after

Dec. 31 and until further advised tickets, single trip or round trip, must not be sold or baggage checked through Portland or East Portland, or to points on its lines in Oregon or California, via either the Northern Pacific Railroad through Pasco Junction or Wallula Junction, or via the Canadian Pacific Railway. It gives further notice that commencing Jan. 1, 1893, it will require its local rates from Portland on any single trip or round trip tickets by way of the Oregon Short Line and Portland to points on its roads in Oregon or California, and in case of round trip tickets returning from California points through Portland over the Oregon Short Line the same rule will be enforced.

A correspondent of the *Coal Trade Journal*, writing from Chicago, says that the railroads of Illinois and Iowa, which use a large percentage of the coal shipped from the mines along the lines of their roads, indulge in a very arbitrary policy concerning regularity of shipments, often postponing the filling of their own bins until the autumn, when cars are in great demand by retail coal dealers. It is claimed that just now the larger roads are taking about 75 per cent. of the total output of the mines on their lines. It is stated that the fuel agents try to have a good supply for locomotives placed at the proper points in July and August so as to leave the cars free for other business when the rush comes. but that the managers put a veto on this policy, on the plea that too much money is locked up. It is claimed that some roads neglect to build sheds of reasonable size and in sufficient number, depending on getting a supply from the mines day by day the year round.

Chicago Traffic Matters.

CHICAGO, Nov. 23, 1892.

Two more traffic associations have, during the past week, voted to disband. The action taken was not unexpected in each case, being a foregone conclusion since the termination of the Western Traffic Association. The Trans-Continental Association was the first to formally vote to disband. The lines represented last week were anxious to arrive at some kind of a makeshift which would prolong the life of the Association until such time as a reorganization could be effected, but the absence of the Great Northern was ominous, and when at last Traffic Manager Finley wired in response to an invitation to be present, that he thanked them, etc , and deeply regretted, etc., but that he could see no necessity or use of his line being represented, as his notice of withdrawal was intended to be final, all hope of saving the Association was abandoned and a resolution was adopted that its affairs would be wound up as soon after Jan. 1 as possible. The only remaining business to be attended to is the apportionment of the last assessment for the Pacific mail "space rental," which cannot be completed much before that time, or possibly later When this is done, the Association will close its offices, unless (which is extremely doubtful) reorganization is effected in the meantime.

On Friday the Trans-Missouri followed suit by passing a resolution that the Affairs of the Association be wound up forthwith. In the case of this association no delay was apparently required and the order took effect at midnight on the day it was passed This was not done, however, without first adopting a resolution appointing a committee on reorganization with instructions to meet Dec. 6 (after the adjourned meeting of the Western Freight Association committee) to see what can be done. There is, however, little probability that there will be any use of this committee meeting at that time, for the chances are few that the adjourned meeting of the other association, on Nov. 30, will come to any agreement looking toward a reorganization of the two associations, or the formation of a new one. The indications are that no new association will be formed for some time, unless rate-cutting and demoralization become so marked that the presidents feel obliged to take decisive steps to stop it.

Officials of Eastern lines in this city are extremely guarded in their expressions of opinion as to the wisdom or meaning of the resolution in regard to World's Fair rates, adopted by the Trunk Line presidents. Officials of Western lines, however, freely express the opinion that rates will be made on a much lower basis when the time arrives for the publication of the sheets. The only parties at present much concerned about the matter are the "entertainment" companies who have quite generally based their figures on half rates.

The Denver lines were unable to reach an amicable agreement with the Union Pacific in regard to the distribution of overland traffic now routed by that company via Omaha, and the result of the protracted meeting held here last week was a circular signed by the Atchison, Colorado Midland, Burlington, Burlington & Missouri River, Rock Island, Denver & Rio Grande and Rio Grande Western requesting connections to remove from sale on Nov. 30 all round trip tickets, or orders for same, reading over the lines of the signers, any portion of which reads over the Union Pacific. It is proposed to take care of Portland passengers by routing them over the Southern Pacific from Ogden via Roseville Junction, and it is claimed that arrangements will be made with the Southern Pacific so that the time required via that route will not be in excess of the present schedule. Opinion is divided as to the effect of this action upon the Union Pacific. It is probable, however, if the lines interested in the movement carry it through energetically, that they will seriously deplete the volume of business via Omaha, as the majority of round-trip travelers wish to make the trip in one direction over the Colorado route. The Northwestern and Alton will support the Union Pacific, but it looks as though the other lines would play a winning hand.

The Northwestern has given notice to shippers that after Dec. 1 flour in their warehouses not moved after 20 days will be sent to public warehouses for storage. When its own warehouses are full, cars will be placed on the track for unloading; if this is not done within five days, the flour will be sent to public warehouses.

The Illinois Central has given notice that hereafter all tickets, other than first-class unlimited, between Memphis and New Orleans will be continuous passage limited.

The "Soo" line is claiming that the Chicago-St. Paul lines are cutting passenger rates. A conference was had Monday, but nothing of importance was done. The other lines do not feel that an accusation coming from the "Soo" line, itself a notorious rate cutter, is worthy of serious consideration.

In the United States District Court here yesterday the case of the United States agt. Thomas Miller, of the Burlington road, the first of the many cases against Messrs. Swift, Egan, Spriggs and others, and the railroad officials under indictment for violating the Interstate Commerce law, was decided in favor of the defendant. The specific unlawful acts charged in the Miller case are, that during the summer of 1890 the defendant gave to A. H. Warren & Co. and Wright & Hoy, Nebraska shippers, certain rates for the transportation of corn from Addison, Ashland, Red Cloud and other points to Chicago, lower than the published tariff rates on file with the Interstate Commerce Commission at Washington. The defence waived an addressed to the jury and the examination of witnesses was at once begun, the first witness being Thomas A Wright, of the firm of Wright & Hoy, Chicago. At the first vital question the defense suggested that the court admonish the witness as to his constitutional rights, and Judge Bunn said: "The witness need not answer any question tending to incriminate himself." This rule held with all the witnesses so the case of course fell through. The court instructed the jury to find a verdict of "not guilty." District Attorney Milchrist thereupon entered a *nolle pros* in the cases of Egan, Johnson, Firmenich and the Swifts. The case against Spriggs was continued on the ground that there is better evidence against him than the others.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Nov. 19 amounted to 71,624 tons, against 68,504 tons during the preceding week, an increase of 3,120 tons, and against 76,849 tons during the corresponding week of 1891. The proportions carried by each road were:

Roads.	W'k to Nov. 19.		W'k to Nov. 12.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	12,153	17.0	10.671	15.6
Wabash	3,386	4.7	3 469	5.1
Lake Shore & Michigan South.	13.890	19.4	12.701	18 5
Pitts., Ft. Wayne & Chicago.	8,774	12.0	8,070	11 8
Pitts., Cin., Chicago & St. Louis	8,726	12 2	7,902	11.5
Baltimore & Ohio	4, 86	6.1	4.531	6.6
Chicago & Grand Trunk	5,424	7.6	4.137	6 1
New York, Chic. & St. Louis.	6,001	8.3	7.010	10.2
Chicago & Erie	5,718	8	6,397	9.3
C., C., C. & St. Louis	3,369	4.7	3.616	5.3
Total	71,624	100.0	68,504	100.0

Of the above shipments, 3.678 tons were flour, 30,129 tons grain and millstuff, 11,359 tons cured meats, 10,691 tons dressed beef, 878 tons butter, 3.073 tons hides and 8,297 tons lumber. The three Vanderbilt lines carried 44.7 per cent., the two Pennsylvania lines 24.2 per cent. The lake lines carried 82,150 tons, against 73,617 tons during the preceding week, an increase of 8,533 tons.

Trunk Line Freight Rates.

The action of the Trunk Lines empowering Commissioner Goddard to vary the differential rates on freight westward from the Atlantic seaboard, which was reported in the *Railroad Gazette* of last week, was followed the next day by similar action regarding east bound freight rates, covering practically all the territory east of Chicago and St. Louis. The Joint Committee of the Trunk lines and Central Traffic Association roads decided to give full authority to vary the rates, as may be found necessary to preserve the proper distribution of freight, to Chairman J. F. Goddard, Vice-Chairman George R Blanchard and Mr. Aldace F. Walker. The resolution concerning west bound rates gave full power to Mr. Goddard alone, but with a provision for calling in Mr Walker in case of dissatisfaction with any decision. The duties assigned to the Board of three, in the matter of east bound rates, seem to imply the engagement of Mr. Walker permanently, though we understand that the vote was passed without any conference with him. As our readers know, the Western Traffic Association, of which he is Chief Commissioner, is now practically dead, although his office has not been formally abolished.

There are at present no differentials on eastbound freight. The westbound rates are as below, New York to Chicago:

	1	2	3	4	5	6
Standard	75	65	50	35	30	25
Difference	70	61	47	33	29	24

The differential rates are over the Erie the West Shore, the Lackawanna and the Lehigh Valley. The New York, Ontario & Western has a still greater differential, its first-class rate being 67 cents. It is stated that there has been no demand for any change in these differentials since they were established.

How Palace Stock Cars Are Used.

The most arrant humbug in railroading to be seen on Western lines is the fancy line stock car. It is fitted up with numerous luxuries for the comfort and accommodation of stock that greatly increase the expense and weight of the car. The representatives of the owners interview stock-raisers and expatiate upon the advantage of using palace stock cars, and secure the bulk of the business. When the stock is shipped the water-troughs are kept upside down and the hay-racks are left empty, but the owners of the stock imagine that the animals are at liberty to eat and drink when they so desire. The owners of the cars get their mileage rates from the railroad companies, and the railroad men swear about the humbugs practiced to defraud their employers of legitimate revenue. In the course of a Western journey of 5,000 miles the writer watched the stock cars on numerous trains and did not find a single case where the water troughs and hay racks were used. The trainmen questioned invariably said that they never watered the troughs.—*Locomotive Engineering.*

The Interstate Commerce Commission.

A DECISION ON OIL TRANSPORTATION.

The Interstate Commerce Commission, in an opinion by Commissioner McDill has announced its decision in the three cases of the Independent Refiners' Association, of Titusville and Oil City, against the Western New York & Pennsylvania and others. The main points decided are as follows:

It is the duty of the carrier to equip its road with the means of transportation, and, in the absence of exceptional conditions, those means must be open impartially to all shippers of like traffic.

Ownership of a car rented to a carrier and for the use of which the carrier pays a full consideration does not of itself entitle the owner to the exclusive use of such car; and if the owner may, in the contract of hire to the carrier, stipulate for the exclusive use of the car, it must be upon such terms as shall not constitute an unjust discrimination against shippers of like traffic, in cars owned by the carrier, and who are excluded from the use of the car so hired.

Where oil is transported by the carrier both in barrels and in tank-cars, and the tank-car is not open to shippers impartially, but is practically limited to one class of shippers, the charge for the barrel package, in barrel shipments, resulting in a greater cost of transportation to the shipper in barrels, is a discrimination against the latter for which no legal justification has been shown in these cases.

The oil rates from Oil City and Titusville, Penn., to New York and New York Harbor points and Boston and Boston points, exclusive of the charge for the barrel package, in barrel shipments, are not shown to be either unreasonable in themselves or relatively unreasonable as between those points.

An agreement for the pooling of traffic between a carrier by rail, subject to the act to regulate commerce, and a carrier by pipe lines, does not fall within the description of contracts prohibited by Section 5 of that act.

Decision on the Long and Short Haul Clause by the Interstate Commerce Commission.

The Interstate Commerce Commission on Nov. 17, in an opinion by Commissioner Veazey, announced its decision in the cases brought by the Georgia Railroad Commission against the Cincinnati, New Orleans & Texas Pacific, the Louisville & Nashville and other railroad and steamship lines, seven cases in all, involving rates for longer and shorter hauls from Cincinnati and other Ohio River points, and from New York and other North Atlantic ports to points in Southern territory. The long and short haul clause of the Interstate Commerce Law is exhaustively discussed, the decisions heretofore rendered by the Commission and the courts being reviewed at length. The main points decided are summarized as follows in the official copy of the decision:

1. The fact of a receivership for a defendant carrier subsequent to completion should not interfere with the process of a proceeding brought merely for the purpose of railway regulation.

2. The phrase "common control, management or arrangement for continuous carriage or shipment" in the first section of the act to regulate commerce was intended to cover all interstate traffic carried through over all rail or part water and part rail lines. The receipt successively by two or more carriers for transportation of traffic shipped under through bills for continuous carriage over their lines is an assent to a common arrangement for such continuous carriage or shipment, and previous formal arrangement between them is not necessary to bring such transportation under the terms of the law.

3 The total rate for through carriage over two or more lines, whether made by the addition of established locals, or of through and local rates, or upon a less proportionate basis, is the through rate that is subject to scrutiny by the regulating authority; how the rate is made is only material as bearing upon the legality of the aggregate charge, and how any reduction may be accomplished is a matter for the carriers to determine among themselves

4. The second, third and fourth sections of the act to regulate commerce are compared with provisions in the English statutes. English decisions are examined, and the frequent citation of such decisions to influence cases brought under greatly dissimilar statutory provisions in this country, without regard to differences in fact of time, extent of country and methods of trade and transportation, are considered and criticised.

5. The fourth section of the act to regulate commerce is construed and the principles as laid down in the petitions of the Louisville & Nashville are reaffirmed, except the ruling therein whereby carriers were permitted to judge for themselves in the first instance of what constitutes "rare and peculiar cases of competition between railroads which are subject to the statute, when a strict application of the general rule of the statute would be destructive of legitimate competition," which is overruled.

6. The competition of carriers subject to the act to regulate commerce does not create circumstances and conditions which the carriers can take into account in determining for themselves in the first instance whether they are justified under the fourth section in charging more for shorter than for longer distances over their line.

7. The competition of markets on different lines for the sale of commodities at a given point served by both lines does not create circumstances and conditions which the carriers can take into account in determining for themselves in the first instance whether they are justified under the fourth section in charging more for shorter than for longer distances over their lines. To determine the force and effect of such competition involves consideration of commercial questions peculiar to the business of shippers, such as advantage of business location, comparative economy of production, comparative quality and market value of commodities, all of which are entirely disconnected from circumstances and conditions under which transportation is conducted. Carriers cannot create abnormal situations by making rates which equalize advantages and disadvantages of localities, and thereupon claim justification for greater charges on shorter hauls on the ground that the lesser long haul charges, which accomplish such equalization, are necessary to secure increase in traffic over their lines.

8. The carrier has the right to judge in the first instance whether it is justified in making the greater charge for the shorter distance under the fourth section in all cases where the circumstances and conditions arise wholly upon its own line or through competition for the same traffic with carriers not subject to regulation under the act to regulate commerce. In other cases under the fourth section the circumstances and conditions are not presumptively dissimilar and carriers must not charge less for the longer distance except upon the order of this commission.

9. When a carrier on complaint under the fourth section avers substantial dissimilarity in circumstances and constitutions as justifying its greater charge for shorter hauls, it is concluded by its pleading and must affirmatively show that the circumstances and conditions of which it is entitled to judge in the first instance are in fact substantially dissimilar; but upon an application for relief under the fourth section proviso the carrier is not limited by such a rule of evidence, and may present to the commission every material reason for an order in its favor. There seems to be no limitation upon the power of the commission to grant relief under that provision, when, after investigation, the commision is satisfied that the interests of commerce and common fairness to the carriers require that an exception should be made.

10. The complaints in Nos. 324 and 325 are dismissed. In cases Nos. 314, 315, 316, 317 and 326, the defendants are ordered to cease and desist from charging more to shorter than to longer distance points mentioned in the complaint, or file applications for relief under the provision clause of the fourth section and show cause thereon, within a time specified.

Practical Thoughts on Lock Nuts.

In presenting the Young Lock to your consideration, we are approaching an old subject in a novel but, we claim, in an effective manner. The most common way, heretofore, of trying to hold a nut on a bolt has been by placing a spring washer between the nut and the splice angle of a rail joint and drawing up the nut until the spring was flattened out. This requires a pressure of 3,000 pounds or more. The nut on a track bolt gets loose and comes off as a result of the straining of threads due to oscillation of engine and cars on the track; such being the case, it would seem certain that the proper means of preventing this looseness of the nut would be to reinforce the nut so that it would resist impact more easily, rather than to put an initial strain on the nut which simply increases the force which produces the results we are trying to overcome.

The *first difference* between the spring washer and the Young Lock then is: The Young Lock prevents the nut coming off the bolt, partly, by **increasing the force resisting the strain** which produces the looseness of the nut, while the spring washer attempts to do the same thing by **increasing this strain.**

The inside washer depends for its efficiency on one of the two following qualities or a combination of the two

First—The spring in the washer itself.

Second—The forcing of the sharp edges or raised surfaces of the washer into the softer metal of the bolt, nut or angle splice.

It is evident that the first depends entirely on the quality of material and workmanship put into the washer in its manufacture; with these two items the most perfect it must be that the constant pounding to which the washer is subjected when strained to its utmost will soon destroy the spring, and the washer become a mere flat washer which must be replaced unless the second quality comes into play.

The second quality depends on a greater or less injuring of the bolt, nut or splice angle, or more likely the thread of the bolt and nut. It is a question whether the second quality is effective after the washer loses its first quality, for as all track bolts wear or stretch some, the slight hold which the rough surfaces of the washer have must be lost when there is no force to keep them up to their work.

The Young Lock, on the contrary, being threaded to suit the bolt and having smooth faces, can do no injury to bolt, nut or thread, and for its efficiency depends on its action as a jam nut aided by the action of gravitation, one of nature's laws, and not on any quality of material and workmanship put into the lock.

The **second difference** then between the spring washer and the Young Lock is: The former depends on the **inherent quality of material and workmanship** and greater or less **injury to track iron,** while the latter does **no injury** and acts by **natural laws independent of both material and workmanship.**

The idea that the spring washer relieves the bolt from concussion or unequal strains seems to us without good foundation; for if the nut be screwed up with the proper pressure the washer becomes flat or nearly so, and if we admit for sake of argument that it retains its spring, the same can only act when the bolt stretches enough to allow some room in which spring can open; and it is extremely doubtful if any such action takes place. For the same reason the spring washer is of no benefit in equalizing temperature changes—the washer being flat under pressure it cannot flatten more to allow for fall in temperature; and as a rise in temperature of 180°, according to Trautwine, produces an extension of ¼ inch in about 8.5 feet, or 0.005 inch in 4 inches, the length of the average track bolt, this may be neglected as too small in amount to require to be compensated for by a spring, especially as this range of change is rarely if ever attained, and consequently the extension is less even than 0.005 inch.

For prices, circulars or samples, address

THE YOUNG LOCK NUT,

ROOM No. 31,

150 BROADWAY, NEW YORK CITY.

YOUNG'S PATENT REVERSIBLE LOCK NUT.

Under date of April 13, 1892, the Supervisor writes:

"For over one month I have had a number of Young's Patent, Reversible Nut Locks on one of the crossing frogs in the Grand Central Railway Yards, where about 500 engines and trains pass daily, and I have watched them closely every day since. They have kept the nuts firmly in place, and no loosening during that time of Nut or Nut Lock has occurred."

NEW YORK CENTRAL & HUDSON RIVER RAILROAD COMPANY,
GRAND CENTRAL STATION.

Under date of Nov. 11, 1892, the Yard and Track-Masters say:

"The Locks above referred to are in the same condition to-day as then, and *have required no adjustment.*"

CANADIAN GOVERNMENT RAILWAYS,
OFFICE OF THE CHIEF ENGINEER AND GENERAL MANAGER,
OTTAWA, July 14, 1891.

Hon. John J. Haggart, Minister of Railways and Canals for the Dominion of Canada, under date of March 14, 1892, in answer to inquiries, officially writes from Ottawa, and among other favorable comments says:

"I have inquired into this matter, and I learn that the Young Pendulum Nut Lock is very favorably spoken of by our officers."

ST. GEORGE, Nov. 7, 1892.

LEVI H. YOUNG, Esq., St. John, N. B.

Dear Sir: In reply to your inquiries as to the results of the trial of the "Young Pendulum Reversible Nut Lock," of which we have 150,000 in use on the Intercolonial Railway, I may state that, so far as we are able to judge in the time they have been in use (one year), they are serving the purpose for which they were designed satisfactorily, and in my judgment it is one of the best nut locks yet brought to my notice.

Yours truly,

COLLINGWOOD SCHREIBER,
Chief Engineer and General Manager.

STATEN ISLAND RAPID TRANSIT RAILROAD COMPANY,
ST. GEORGE, Nov. 7, 1892.

In May last Mr. G. L. Davidson put some of the Young Nut Locks on our track to make a test. During that time I watched them closely, and was so well pleased with them that I have since ordered and have just put on 5,000 of these nut-locks in order to make a more thorough test.

(Signed), W. O. SPRIGG,
Master of Road and Transportation.

MIDDLESEX VALLEY RAILROAD COMPANY,
RUSHVILLE, N. Y., Nov. 4, 1892.

The Young Nut Locks ordered have been received, and are being put in place. We have adopted this nut lock on our road, and expect good results.

(Signed), R. F. UNIACKE,
Chief Engineer.

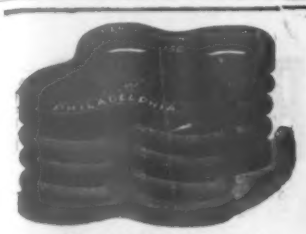
DAILY SALES OF WESTINGHOUSE ENGINES

DURING THE MONTH OF OCTOBER, 1892.

Date.			H. P.
1.	Philadelphia & Reading Terminal R. R.	12th order,	Philadelphia, Pa.	85-Comp.
1.	" "	13th "	" "	85 "
1.	" "	14th "	" "	85 "
1.	" "	15th "	" "	85 "
1.	" "	16th "	" "	85 "
1.	Pittsburg *Chronicle-Telegraph*	3d "	Pittsburgh, Pa	60-Stan.
3.	West Michican Furniture Co.		Holland, Mich	25-Jun.
3.	H. Mueller Plumbing Co.		Decatur, Ill	35 "
4.	F. J. Parson's & Co.		Nineveh Junc., N. Y.	15 "
5.	Cochrane Chemical Co.	3d "	Boston, Mass	35-Stan.
5.	Cresent Steel Co.	6th "	Pittsburgh, Pa	75-Jun.
5.	Pennsylvania Tube Works		" "	75 "
5.	Dawson Electric Light and Power Co.	1st "	Dawson, Pa.	75 "
5.	" " "	2d "	" "	75 "
5.	" " "	3d "	" "	35 "
5.	Nicaragua Engineering Co.		Managua, Nic	10 "
5.	Adam Blumer		Monroe, Wis.	25-Stan.
5.	Bridgeport Copper Co (kodak)	6th	Bridgeport, Conn	100-Comp.
7.	Westinghouse El. & Mfg. Co.	35th "	Pittsburgh, Pa.	330 "
7.	" " " "	36th "	" "	130 "
7.	Wm. Clark Thread Co.		Westerly, R. I.	10 Stan.
7.	United Gas Imp. Co.	25th "	Philadelphia, Pa.	75 "
7.	H. J. Russell		Tekoa, Wash.	50 Jun.
7.	Evanston El. Il. Co.	5th "	Evanston, Ill.	100 Comp.
7.	J. E. Reinecker		Chemnitz, Ger.	85 "
7.	Yuan Boyer		Ygualade, Spain	45 "
7.	Yg. Y. Bertran		San Felice	65 "
7.	Jose Solderila Casas		Balsareny	85 "
7.	Jose Tobra		Castellar	200 "
8.	Rourke, Stroub & Co		Knoxville, Tenn.	35 Jun.
10.	Pittsbugh Reduction Co.	5th "	Kensington, Pa.	330 Comp.
10.	" "	6th "	" "	330 "
10.	Detroit Citizens' Street Railway Co.		Detroit, Mich.	260 "
11.	Montgomery Street Railway		Montgomery, Ala	130 "
11.	Columbian Exposition	5th "	Chicago, Ill	130 "
11.	" "	6th "	" "	130 "
11.	Odd Fellows Hall	1st "	Philadelphia, Pa	85 "
11.	" " "	2d "	" "	85 "
11.	" " "	3d "	" "	85 "
11.	First National Bank Building	1st "	Pittsburgh, Pa	45-Stan.
11.	" " " "	2d "	" "	45 "
13.	Tacony Iron and Metal Co.	1st "	Tacony, Pa.	25 "
14.	S. D. Warren & Co	26th "	Yarmouthville, Me.	85-Comp.
14.	W. G. Wildermauth		Pomeroy, O	5-Jun.
14.	F. Glazier & Son	2d "	So. Glastonb'ry, Conn.	25 "
15.	Union Hardware Co.		Torrington, Conn.	160-Comp.
17.	Johnstown Pass. Railway Co., (kodak.)		Johnstown, Pa	330 "
17.	Rust & Mason	2d "	Forest Mills, Minn.	65 "
17.	Shaw Stocking Co		Lowell, Mass.	10-Jun.
17.	Kalamazoo Paper Co.	2d "	Kalamazoo, Mich.	75 "
17.	Unknown		Moscow, Russia	35 "
17.	"		" "	25 "
17.	"		" "	15 "
17.	Unknown		Moscow, Russia.	35 Stan.
17.	"		" "	25 "
17.	"		" "	15 "
18.	O. B. Shallenberger		Rochester, Pa.	15 "
18.	Irvin Van Wie	9th order,	Syracuse, N. Y.	15 "
18.	R. D. Nuttall & Co.	2d "	Allegheny, Pa.	15-Jun.
20.	Fontaine Crossing Co.	8th order,	Detroit, Mich	5-Jun.
20.	Roberto Law	4th "	Monterey, Mexico	5-Stan.
22.	Standard Oil Co.	3d "	Bayonne, N. J.	35 "
22.	Hoyle, Harrison & Kaye		Philadelphia, Pa.	25 "
22.	Alexander McLaren		Osceola, Ont	50-Jun.
24.	E. B. Hilman & Co.		Kahoka, Mo	50 "
25.	Spreckels Sugar Refinery	64th "	Philadelphia, Pa.	75-Stan.
25.	" "	65th "	" "	100 "
25.	" "	66th "	" "	100 "
25.	" "	67th "	" "	100 "
25.	" "	68th "	" "	100 "
25.	Otis Falls Pulp Co.	2d "	Otis Falls, Me	5 "
25.	Charleston Gas and Electric Light Co.	2d "	Charleston, W. Va.	330-Comp.
25.	Robert Mitchell Furniture Co.		Cincinnati, Ohio	50-Jun.
26.	Long & Marvin		Glenville, Minn.	35 "
26.	William Knight		Chicago, Ill	35-Stan.
26.	Tacony Iron and Metal Co.	2d "	Tacony, Pa	10 "
26.	Justice, Bateman & Co.	2d "	Philadelphia, Pa.	15 "
27.	Moore, Arms & Thompson		Bellows Falls, Vt.	75 "
28.	Balt. Elect. Refin. Co	5th kodak)	Baltimore, Md.	100-Comp.
29.	Balt. Traction Co.	(kodak.)	" "	260 "
29.	Penoles Mining Co.		Mapimi, Mex	10-Jun.
29.	Ott, Mergenthaler & Co.		Baltimore, Md.	50 "
31.	Globe Furniture Co.		Northville, Mich.	75 "
31.	Cohannett Mills		Taunton, Mass.	5-Stan.
31.	Gaiety Bijou Theatre		Boston, Mass.	5 "
31.	Niag. Falls Paper Co.		Niagara Falls, N. Y.	35 "
31.	Waters-Pierce Oil Co		St. Louis, Mo.	50-Jun.
31.	Columbian Exposition	7th order,	Chicago, Ill	330-Comp.
31.	" "	8th "	" "	330 "
31.	Unknown		St. Louis, Mo.	50-Jun.
31.	Westinghouse Machine Co.	10th "	Pittsburgh, Pa.	25 "
31.	Kahn, Lang & Co.		Espinall, France	65-Comp.
31.	Monongahela Furnaces	1st "	McKeesport, Pa.	5-Stan.
31.	" "	2d "	" "	5 "
31.	Carnegie Steel Co.	16th "	Pittsburgh, Pa	5 "
31.	Allegheny Co. Lt. Co.	54th "	" "	5 "
31.	" "	55th "	" "	5 "
31.	Otis Falls Pulp Co.	3d "	Otis Falls, Me.	5 "

SUMMARY.

33	Compound Engines, aggregating	-	5,185 H. P.
35	Standard " "	-	1,180 "
30	Junior "	-	1,160 "
	TOTAL, 98 ENGINES, aggregating	-	**7,525 H. P**



FRANK S. LAYNG, CHAIRMAN. C. R. KEARNS, SECRETARY AND TREAS

PICKERING SPRING CO., Limited

MANUFACTURERS OF

Railway Springs of Every Description

10 WALL ST., NEW YORK
237 FRANKLIN ST., BOSTON
719 PHOENIX BUILDING, CHICAGO

PHILADELPHIA

THE JERSEY CITY WHEEL FOUNDRY AND MACHINE WORKS

HIGH GRADE CHILLED CAR WHEELS

ALL WHEELS GUARANTEED TO STAND 1,000 LBS.

THE WASHBURN CAR-WHEEL COMPANY

HARTFORD, CONN.

CRUCIBLE

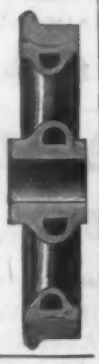
STEEL-TIRED WHEELS,

For Parlor and Sleeping Cars, Passenger Coaches, Locomotive and Tender Trucks.

CAST-IRON CENTRES

WELDED TO

Hammered & Rolled Crucible Steel Tires.



LOBDELL CAR WHEEL CO., WILMINGTON, DEL.

Established 1836.

Double Plate, Single Plate AN Hollow Spoke WHEELS FOR Broad and Narrow-Gauge Cars Engines and Tenders.

Also OPEN AND Solid Plate STREET CAR WHEELS

Either in the Rough or Fitted on Axles.

CAPACITY, 500 WHEELS PER DAY.

THE BOIES STEEL WHEEL CO. SCRANTON, PA.,

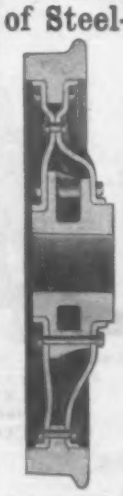
Makers of Steel-Tired Railway Wheels.

No. 1.—**DOUBLE STEEL PLATE,** Corrugated, Flexible. Approved by 10 years' general service.

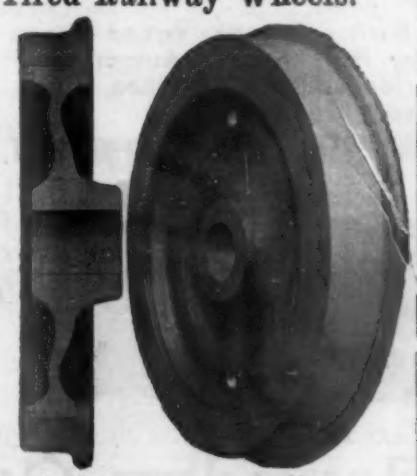
No. 2.—**WROUGHT IRON CENTRE,** with Steel Tire fastened by the Boies **Integral Tire Lock.** Only two parts—the practically indestructible Centre; the Steel Tire which can be replaced in any Railway Shop when worn out. **The Centre a Permanent Investment.**

Coolbaugh & Pomeroy, General Sales Agents, 20 Broadway, N. Y.

H. W. Boies, Western Agent, 531 The Rookery, Chicago, Ill.



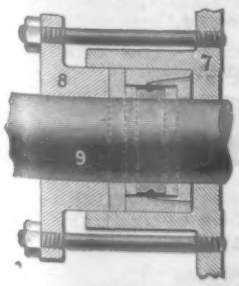
No. 1.

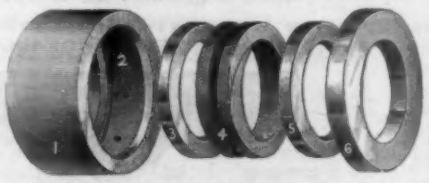


No. 2a. No. 2b.

Columbian Metallic Rod Packing Co.

F. P. & J. T. MARTIN, Inventors and Patentees.





A Self-Adjusting Packing for ALL kinds of Piston Rods, Valve Stems, Throttle Stems and Air-Pumps.

NO SPRINGS.

Thirty Days' Trial.

Method of Measuring.
Diameter o Stuffing Box,
Depth of Stuffing Box.
Diameter of Rod.
Length of Gland.

OLD GLAND USED.

Perfect Metallic Packing.

418-20 WALNUT ST., PHILADELPHIA, PA.

THE BUDA FOUNDRY & MFG. CO

MANUFACTURERS OF

HAND AND PUSH CARS

With Steel or Wood Wheels

RAILWAY SUPPLIES

Switch Stands, Switch Fixtures, Head Chairs, General Foundry AND *MACHINE WORK.*

General Office & Work HARVEY, COOK CO., Ill.

CHICAGO OFFICE: Room 607, 138 Jackson Street.

ESTABLISHED 1847. PHILADELPHIA, PA.

A. WHITNEY & SONS.

CHILLED WHEELS Of Best Charcoal Irons. In Best Contracting Chills. By Best Annealing Process EVERY SERVICE

STEEL TIRED WHEELS, with Strong Cast-Iron CENTRES WELL ANNEALED

THE CAYUTA WHEEL AND FOUNDRY CO AND SAYRE STEAM FORGE

MANUFACTURERS OF

WHEELS

AND

AXLES

For Locomotives, Tenders, Passenger and Freight Cars

RAILROAD CASTINGS AND HEAVY FORGINGS.

HOWARD ELMER, Pres. F. E. LYFORD Treas. M. C. CHAPMAN, Supt.

SAYRE PA.

FULLER BROTHERS & CO

139 GREENWICH STREET, NEW YORK.

SOLE AGENTS FOR

DOVER IRON CO. OF NEW JERSEY.

BOILER RIVETS, BRACE JAWS, STAY BOLT IRON

ALSO

NUTS. BOLTS AND WASHERS.

AMERICAN PRACTICE

—IN—

BLOCK SIGNALING,

With Descriptions and Drawings of the Different Systems in Use on Railroads in the United States.

This is a handsomely printed, elegantly bound volume, 7¾ in. x 9 in. It describes clearly the Simple Block System, Single Track Blocking Sykes' System, Automatic Block Work, Peace Circuit Signals and the Electro-Pneumatic Track-Circuit System.

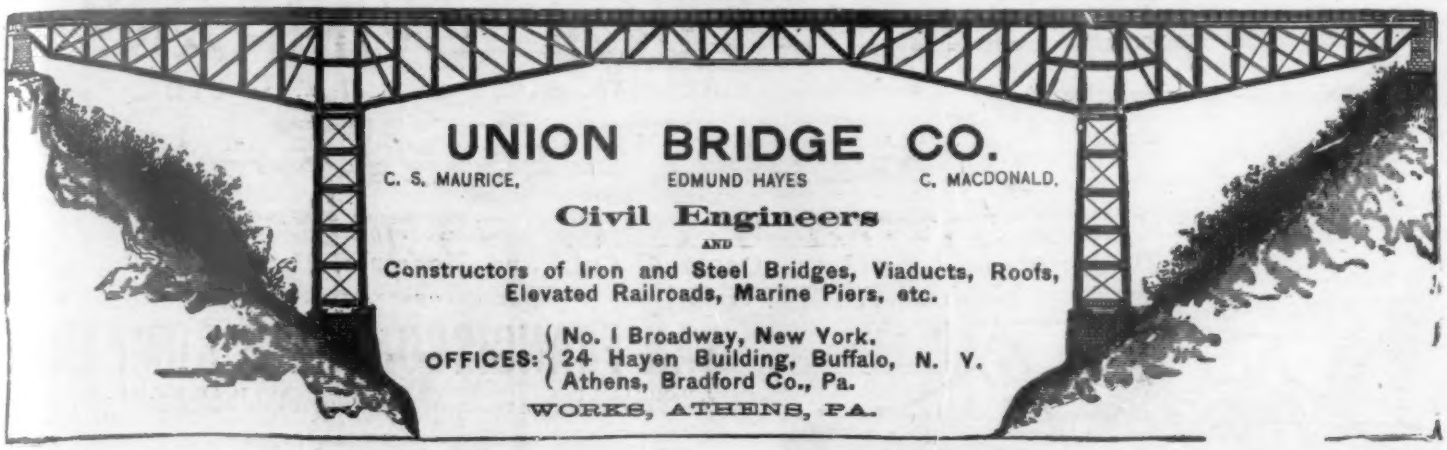
It contains elaborately illustrated descriptions of the systems in use on the Pennsylvania, Boston & Albany, Fitchburg and New York Central roads, and correct engravings and descriptions of the Westinghouse Pneumatic, the Hall Automatic and Black's Automatic Systems; and also of the Illuminated Semaphore, Koyl's Parabolic Semaphore and the Stewart-Hall Train Order Signal.

The book is designed to make the methods of block signaling clearly understood and to show the present development of the art on American railroads.

PRICE, $2.00.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE 73 Broadway, New York.



UNION BRIDGE CO.

C. S. MAURICE. EDMUND HAYES C. MACDONALD.

Civil Engineers

AND

Constructors of Iron and Steel Bridges, Viaducts, Roofs, Elevated Railroads, Marine Piers, etc.

OFFICES: No. 1 Broadway, New York. 24 Hayen Building, Buffalo, N. Y. Athens, Bradford Co., Pa.

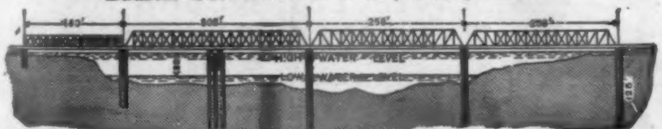
WORKS, ATHENS, PA.

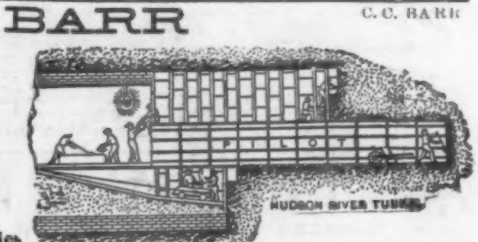
J. F. ANDERSON. C. C. BARR

ANDERSON & BARR

ENGINEERS AND CONTRACTORS.

Address 240 Eleventh Street, Jersey City.





Pneumatic Work, Deep Foundations and Tunneling in Soft Materials Specialties

Control the Patents for the Automatic Dredge and the Anderson System of Tunneling.

THE PHŒNIX BRIDGE CO., Successors to Clarke, Reeves & Co.

PHŒNIXVILLE BRIDGE WORKS

Offices: 410 Walnut St., Phila. 49 William St., New York. 931 Rookery, Chicago. A.C. Stiles, Eng. Phœnixville, Pa.

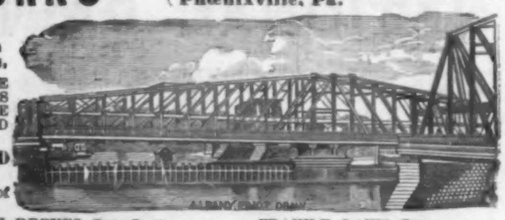
ENGINEERS AND BUILDERS OF

Bridges, Viaducts, Roofs, Turn-Tables, Etc.

SPECIALTIES: Accurate Workmanship; the use of Double-Refined Iron; no welds; Phœnix Upper-chords and Posts; the best form of Strut known.

ALL WORK DONE ON THE PREMISES — FROM ORE TO FINISHED BRIDGES.

ILLUSTRATED ALBUM Mailed on receipt of $3.00.



DAVID REEVES, President. ADOLPHUS BONZANO, Vice-Pres. and Chief Eng'r. WILLIAM H. REEVES, Gen. Supt. FRANK T. DAVIS, Treasurer.

A. & P. ROBERTS & COMPANY.

PENCOYD IRON WORKS

MANUFACTURERS OF

Wrought Iron and Open Hearth Steel,

OFFICE: 261 S. 4th Street, PHILADELPHIA, Pa.

PENCOYD BRIDGE & CONSTRUCTION COMPANY

DESIGNERS AND MANUFACTURERS OF

BRIDGES, VIADUCTS, TURN TABLES, Etc.

WORKS, PENCOYD, PA.

THE PITTSBURGH BRIDGE CO.

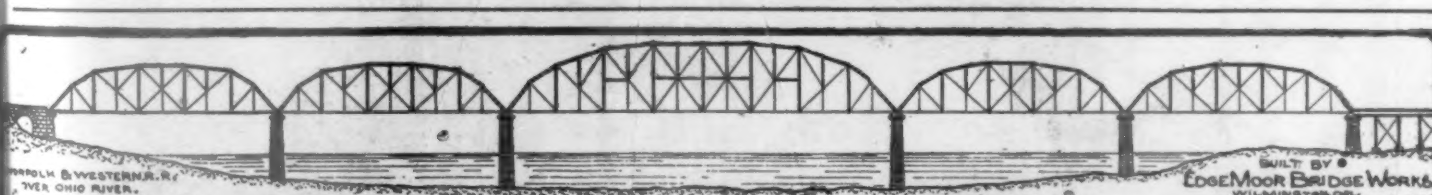
WESTERN OFFICE: 1105 OWINGS BUILDING, CHICAGO.

W. W. CURTIS, Western Representative.

KEYSTONE BRIDGE CO.

General Office and Works, Pittsburgh, Pa.

Western Office, 205 LaSalle St., Chicago, Ill. Eastern Office, 46 Wall St., New York.



THE POTTSVILLE BRIDGE COMPANY.

DESIGNERS AND BUILDERS OF

BRIDGES, VIADUCTS, ROOFS, ETC.

Office: No. 226 South Fourth Street, Philadelphia, Pa. Works: Pottsville, Pa

---

THE YOUNGSTOWN BRIDGE CO.

MANUFACTURERS OF IRON & STEEL

BRIDGES

IRON STRUCTURAL WORK IRON ROOF AND TURN TABLES

YOUNGSTOWN, O.

James Neilson, Pres. W. T. Cooke, Ch. Eng. R. P. Boyd, Sec. & Treas.

CHICAGO BRIDGE & IRON CO

443 Rookery Building, CHICAGO, ILL.

Works: 105 & 106 Sts., Rock Island & Panhandle Railroad.

Successors to Kansas City Bridge & Iron Co., Kansas City, Mo.; Horace E. Horton, Rochester, Minn.

MANUFACTURERS OF

METALS for STRUCTURES.

CONTRACTORS AND BUILDERS

Steel, Iron and Combination Bridges. Masonry and Metal Substructures

ov. 25, 189

s.

) $250,000

NY.

ce Pres.

ORS.

ion Dredg

GLAU.

AU,

ES.

PA.,

'S.

21.
OIL

rail-

Nov. 25, 1892.

SHI

Railway

LOUISVILLE

OFFICE AND W

TRIANGU

and other forms of Iron
Tables, Frogs, Switches,

J. M. JOHNSON, Pres.

ROCHEST

Successors to

RO

WROUGHT IRON

AI

LONG

Cap

Run all the

NEW JE

B

COC

Plans and Es

MODEL

WYCKOFF, SEA

J. W. MILLS

has more Rail
other railroad
higher than th

...lands.
...ID UP) $250,000
...MPANY.
...E., Vice Pres.

...N. Y.
...Wash.
...ACTORS.
...for Suction Dredg...

...BCHNIGLAU.
...GLAU,
...tors,
...UCTURES.
...hea o Ill.

..., PA.,
...NTS.
...TY.

...ASPHALTUM No. 21.
...PURE LINSEED OIL

...KET.
...OO DEGREES.
... of the leading rail-

...etc.

...lss. R. R.
...V. & Tol. R. R.
...re & M. S. R. R.
...N. Y. & Pa. R. R.
... Pacific R. R.
...S. Fe R. R.
... Pacific R. R.

...pplication.